Massachusetts Bays
NATIONAL ESTUARY PARTNERSHIP

Margherita Pryor
U.S. Environmental Protection Agency, Region 1
5 Post Office Square
Boston MA 02109

June 11, 2021

Dear Margherita:

We are pleased to submit Massachusetts Bays National Estuary Partnership (MassBays') application for funding to implement our Federal Fiscal Year 2021 Workplan. In spite of the imposition of stay-at-home mandates from the Governor, MassBays staff and regional coordinators have accomplished much in this past year, for example:

- Incorporating ecosystem services into our ongoing effort to identify habitat-based target conditions for the Bays.
- Launching our new app, AquaQAPP, with endorsements from EPA Region 1 and MassDEP quality-assurance staff.
- Awarding more than $95,000 through our Healthy Estuaries Grant Program toward meeting CCMP goals.
- Engaging volunteers in herring counts, water quality monitoring, restoration projects, and invasive species management, even in the midst of a global pandemic.
- Analyzing 8 years' post-restoration monitoring data from salt marsh restoration projects on Cape Cod.
- Increasing our capacity to support environmental justice communities and foster diversity, equity, and inclusion in MassBays programming.
- Leveraging EPA's investment at a rate of $63:$1 during the NEPORT reporting period of October 1, 2019 through September 30, 2020.

MassBays' Management Committee reviewed and approved this application, and endorsed the tasks included as important steps toward implementing our CCMP.

Please do not hesitate to contact us if you have any comments, suggestions, or concerns regarding the workplan.

Sincerely,

Pam DiBona
Executive Director
Massachusetts Bays National Estuary Partnership
pamela.dibona@mass.gov
339-368-0608 (cell)

Colin Van Dyke
Management Committee Chair

cc: Lisa Berry Engler, EEA/CZM

Contents

Acronyms and Abbreviations

ANEP	Association of National Estuary Programs
APCC	Association to Preserve Cape Cod
BCG	Biological Condition Gradient
BHEN	Boston Harbor Ecosystem Network
BU	Boston University
CC	Cape Cod (MassBays Region)
CCC	Cape Cod Commission
CCCD	Cape Cod Conservation District
CCMP	Comprehensive Conservation and Management Plan
CCS	Center for Coastal Studies
CCWRRP	Cape Cod Water Resources Restoration Project
CS	Central Staff (MassBays Boston Office)
CSA	Citizen Science Association
CSO	Coastal States Organization *or* Combined Sewer Overflow
CWA	Federal Clean Water Act
NEPCWG	National Estuary Program Coastal Watershed Grant Program
CZM	MA Office of Coastal Zone Management
DCR	MA Department of Conservation and Recreation
DEP	MA Department of Environmental Protection
DER	MA Department of Fish and Game, Division of Ecological Restoration
DMF	MA Department of Fish and Game, Division of Marine Fisheries
DPW	Department of Public Works
ED	Executive Director, MassBays
EDA	Estuary Delineation and Assessment
EPA	U.S. Environmental Protection Agency
ENHC	Essex Natural Heritage Commission
ESG	Ecosystem Services Gradient
FTE	Full-time Equivalent
GOMC	Gulf of Maine Council on the Marine Environment
GOMI	Gulf of Maine Institute
IRWA	Ipswich River Watershed Association
ISA	Interagency Service Agreement
LGC	Local Governance Committee
LID	Low Impact Development
LNS	Lower North Shore (MassBays Region)
LOE	Level of Effort
MC	Management Committee
Mass Audubon	Massachusetts Audubon Society
MassBays	Massachusetts Bays National Estuary Program
MassDOT	MA Department of Transportation
MB	Metro Boston (MassBays Region)
MBL	Marine Biological Laboratory
MCCA	Massachusetts Coastal Condition Assessment
MET	Massachusetts Environmental Trust
MIT Sea Grant	MIT Sea Grant College Program
MMC	Massachusetts Marine Collective
MOP	Massachusetts Oyster Project
MOTN	Marine & Oceanographic Technology Network
MME	Massachusetts Marine Educators
MPG	Multipurpose Program Grant
MS4	Municipal Separate Storm Sewer Systems
MVP	Municipal Vulnerability Preparedness

Acronyms and Abbreviations, continued

MVPC	Merrimack Valley Planning Council
MWRA	Massachusetts Water Resources Authority
MRWC	Merrimack River Watershed Council
MyRWA	Mystic River Watershed Association
NECC	Northern Essex Community College
NEOSEC	New England Ocean Science Education Collaborative
NEP	National Estuary Program
NEPORT	NEP On-line Reporting Tool
NERACOOS	Northeast Regional Association of Coastal and Ocean Observing Systems
NERRA	National Estuarine Research Reserve Association
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NS	North Shore (LNS + UNS MassBays regions)
NSRWA	North and South Rivers Watershed Association
NU	Northeastern University
NUMSC	Northeastern University Marine Science Center
NWF	National Wildlife Federation
NWR	National Wildlife Refuge
O&M	Operations and Management Plan
ORD	Office of Research and Development, EPA
OST	Office of Science and Technology, EPA Headquarters
PFAS	Per- and PolyFluoroAlkyl substances
PIE-Rivers	Parker-Ipswich-Essex Rivers Restoration Partnership
PRNWR	Parker River National Wildlife Refuge
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RC	Regional Coordinator
RCC	Restoration Coordination Center (Cape Cod)
RPA	Regional Planning Agency
RSP	Regional Service Provider
SLL	Stone Living Lab
SLR	Sea Level Rise
SS	Staff Scientist, MassBays OR South Shore (MassBays Region)
SSCW	Salem Sound Coastwatch
SSL	Sustainable Solutions Lab
SSU	Salem State University
STAC	Science and Technical Advisory Subcommittee, MassBays
SWIM	Safer Waters in Massachusetts
TNC	The Nature Conservancy
TTOR	The Trustees of Reservations
UMCES-IAN	UMd Center for Environmental Studies, Integration and Application Network
UHI	Urban Harbors Institute
UNH	University of New Hampshire
UNS	Upper North Shore (MassBays Region)
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
U/U	Underserved/underrepresented
WAA	Watershed Action Alliance
WBNERR	Waquoit Bay National Estuarine Research Reserve
WHOI	Woods Hole Oceanographic Institution
WWTP	Wastewater Treatment Plant

A. Summary

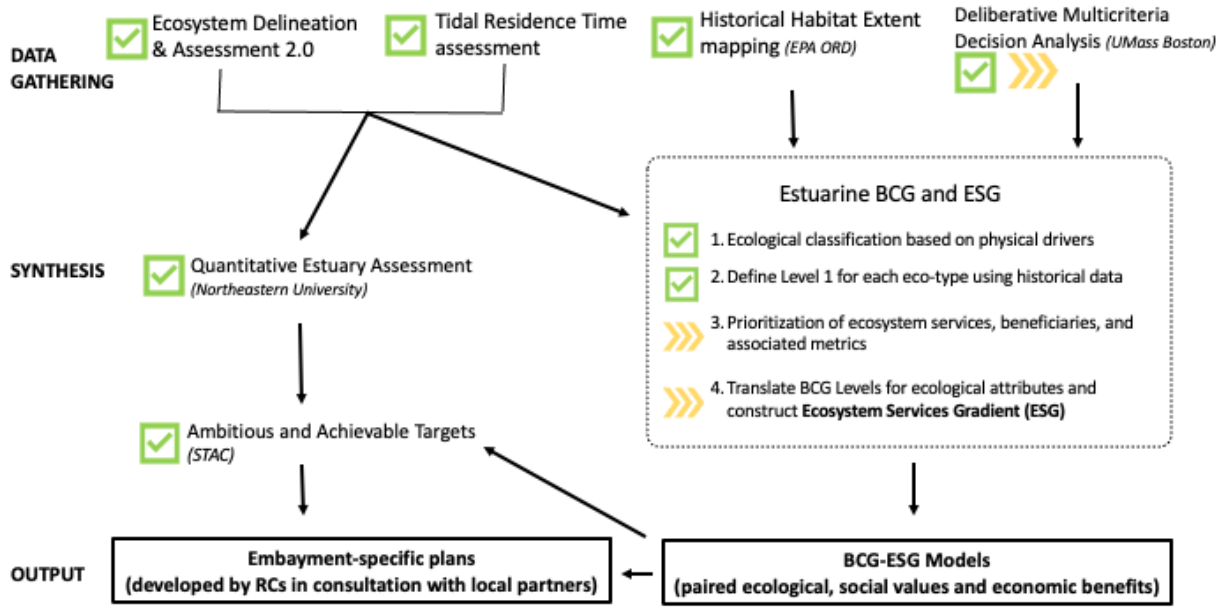
2020-2021 Progress and Accomplishments

In our annual ***NEPORT reporting*** to EPA for October 2019 through September 2020, MassBays submitted documentation of 216 acres of habitat restored, and leveraged funding of nearly $42Million, or $63 in cash and in-kind support secured for every $1 invested by EPA, including significant investment by the Commonwealth in climate resilience for Lower North Shore MassBays communities. Leveraged funds are in addition to the 1:1 non-federal resources put forward as direct match to EPA's funding under CWA §320.

MassBays' ***Comprehensive Conservation and Management Plan*** (CCMP) has been considered interim to now, having been revised according to comments from EPA Headquarters and Region 1 staff, but lacking specific targets for habitat conditions. To meet that condition for finalizing the CCMP, MassBays and EPA's Office of Research and Development, with local partners, continued work on a multi-faceted and innovative approach employing Biological Condition Gradients and Ecosystem Goods and Services analyses, presented to the Management Committee for their review and endorsement in June 2021.

Figure 1. *MassBays' State of the Bays reporting has been limited due to the scarcity of planning area-wide data. CCMP Goal 3 is focused on improving our ability to generate comprehensive reporting that is tied to desired conditions. The process flowchart below records MassBays' FFY20 activities to devise ecosystem targets and generate reporting tools, all toward increasing our ability to inform local action for improved conditions. Outputs are goals for this coming year.*

☑ = completed; ››› = ongoing



EPA §320 funds were also applied to supplement funding from the EPA Exchange Network and MassDEP to ***finalize and launch AquaQAPP***, a web-based tool developed to assist community-based monitoring groups in preparing Quality Assurance Project Plans. The application generates QAPPs that are pre-approved by MassDEP and should be acceptable to EPA Region 1, and therefore do not require review prior to implementing the sampling program.

Four entities working toward improved conditions in the Bays received ***Healthy Estuaries Grant Program awards*** for the period of August 2020 through December 2021; a total of $95,615 was awarded and matched by nearly $200,000 in private contributions and in-kind services.

In lieu of an in-person State of the Bays Symposium (rescheduled for this coming year), MassBays contracted with a science communications professional to devise and implement a family-friendly ***Science Walk*** in downtown Boston.

Meanwhile MassBays' Regional Service Providers (RSPs) continue ***on-the-ground work with partners*** in our five subregions, providing technical support to municipalities; generating and sharing monitoring data with state, local, and federal agencies; and conducting outreach to multiple audiences.

See ***Section B, Completed Major Projects***, for more detail on these and other accomplishments.

Table 1. *MassBays' progress toward realizing CCMP Goals*

Goal 1. MassBays provides new resources to support research and management in the Bays			
Action/Activity	**Target Year**	**Completed**	**Output**
1.1.a. Identify gaps in data sets	2019	2020	master list of research needs shared on website
	2020		online tool soliciting data & research needs from stakeholders
	2022, 2025, 2028		updated master lists of research needs and data gaps
1.1.b. Prioritize addressing gaps per need, completeness and reliability of new and existing data, relevance to U/U communities, application to SotB reporting, and potential policy applications	2021, 2022, 2025, 2028		List of priority data gaps included in each SotB, EDA update, with evidence of input from diverse stakeholders
1.1.c Maintain Estuarine Delineation and Assessment as a record of current data availability	2019	2020	ArcGIS Story Map posted on website
	2022		EDA 3.0
	2026		EDA 4.0
1.1.d Provide input re: data needs to entities funding and conducting monitoring and restoration	yearly	2019	EPA MPG grant ($50,000), DEP MCCA ISA ($150,000)
	yearly	2020, 2021	announcements to audiences (Monitoring coordinators' network, academia, watershed associations, MOTN, MACC) for research and monitoring actions.
1.2.a Implement a MassBays-wide monitoring framework that incorporates long-term monitoring program data and makes data and findings available to the public	2019	2018, 2021	Inventory of trends & conditions monitoring programs in the Bays
		2019-2021	cyanobacteria (CC), nutrients in Salem Sound (LNS), salt marsh condition (SS, NS), herring runs (SS, CC), invasive spp (NS, SS), WQ (NS, SS), coastal acidification (LNS)
	2021	2020-2023	document baseline conditions for future comparisons (MCCA)
	2021	2021	MassBays ecosystem tracking data sets are stored in EPA's WQX
	2023		MassBays ecosystem tracking incorporates additional QA'd data sets
1.2.b Convene and partner with citizen monitoring coordinators, researchers, QA/QC agency staff, others to support and improve monitoring outputs	2020	2021	AquaQAPP launched
	2019	2019	Circuit Rider hired
	ongoing	2019-2021	meetings, webinars hosted to present available resources, solicit needs
	biennially	2021	MassBays/partners present at CSA conferences
	2021	2021	present at National Monitoring conference
1.3.a Analyze connections among datasets and trends to inform reporting, actions, and policies	ongoing	2019	Strategic monitoring plan finalized, including data analysis guidance
		2020	WQX templates adapted to standardize metadata
1.3.b Provide SotB reporting at multiple scales	ongoing	2019, 2020	Cape Cod State of the Waters published

Goal 2. MassBays reaches all planning-area municipalities with actionable information about coastal habitats			
Action/Activity	**Target Year**	**FY Completed**	**Output**
2.1.a Identify, evaluate, and support research regarding effectiveness of conservation & restoration activities	2020, 2022, 2024, 2026, 2028	2021	Results of post-restoration salt marsh monitoring (CC)
		2020	Healthy Estuaries Grants awarded, 5% budget set aside for 2022
		2020	results of 2018-2020 grants posted online
		2019-2020	impacts of dam removals assessed (SS)
2.1.b Test and implement innovative monitoring (including rapid field assessments) and restoration approaches	ongoing	2021	Developed protocol for rapid cyanobacteria monitoring (CC)
		2020	gathered real-time monitoring data using SeaTrac's autonomous vessel, funded ditch remediation proof-of-concept research via HE grant
		2019	designed and implemented a citsci-based eelgrass assessment protocol
		2018-2020	funded design & build of new coastal acidification monitoring instrument
2.1.c Support cross-sector information sharing	ongoing; 2020, 2022, 2025, 2027	2019	Field visits hosted by RSPs carried out across the planning area
		2020	MassBays ED served as Chair of ANEP
2.2.a Revise and disseminate existing, effective education and outreach materials, and develop new materials and outreach efforts, providing context and integrating multiple sources	ongoing	2021	MassBays Science Walk highlighting research, monitoring, and restoration activities supported with §320 funds presented in Boston
		2021	#MassWrack iNaturalist project launched
		2020	City Nature Challenge - Boston Area expanded to Cape Cod
2.2.b Engage with local decisionmakers and residents for habitat protection and restoration to mitigate impacts of increased freshwater inputs, SLR, and storm surges , including promoting nature-based approaches	ongoing	2020-2021	multiple presentations and publications delivered to target audiences
		2020-2021	multiple partnerships, assistance to municipalities documented
		2020-2021	initiated and engaged in new efforts to increase attention to WQ issues in the Merrimack River (UNS)
2.2.c Communicate about climate change impacts and vulnerabilities at the local level	ongoing	2020	lecture series, site-specific outreach implemented (LNS, MB, SS)

Goal 2. *continued* MassBays reaches all planning-area municipalities with actionable information about coastal habitats			
Action/Activity	**Target Year**	**Completed**	**Output**
2.3.a Review and adjust Management Committee composition to ensure diverse, representative input to MassBays' planning	2019-2021		
2.3.b Engage partners who work with U/U communities in MassBays' regions	ongoing	2021	Awarded Healthy Estuaries Grant monies for work in EJ communities
		2021	Joined Massachusetts Marine Collective to increase resources and opportunities available to underrepresented communities (MB)
		2019	hosted presentation by Chelsea Greenspace, engaged with UMass Boston's Sustainability Lab to explore opportunities
		2019	network analysis of restoration collaboration and input (MB)

Goal 3. MassBays provides regular and locally informed State of the Bays reporting that reflects the unique characteristics of MassBays assessment units (embayments, rocky shore, barrier beach), and documents progress toward target conditions.			
Action/Activity	**Target Year**	**Completed**	**Output**
3.1.a Identify indicators and metrics to describe diversity and similarities among embayments, rocky shore, beaches and dunes across MassBays' planning area	2020, 2021, 2024, 2027	2021	Metrics proposed to MC by STAC
		2020	embayment categories finalized, ecotypes assessed
3.1.b Identify target conditions to guide management and restoration decisions	2019 - 2021	2021	Local expert focus groups held, ecosystem gradient framework applied
		2020	historic data collected, stakeholder process determined
3.2.a Develop and implement action plans according to targets	2021 and ongoing		
3.2.b Promote activities to improve and protect estuarine values and resources	2020 and ongoing	2021	Training videos for municipal staff re: LID maintenance (LNS)
		2020	State of the Waters: Cape Cod employed to spark resource
		ongoing	maintain adequate streamflow in First Herring Brook (SS), eelgrass restoration (UNS), invasive spp removal (NS)
3.2.c Measure and report on progress toward targets	2021 and ongoing		
3.3.a Conduct evaluation of organizational and programmatic impact	PE 2023, 2028; Comm eval 2025,2029		
3.3.b Establish and support collaborative efforts in MassBays' regions that increase opportunities to leverage new resources	ongoing	2021	63:1 leverage on EPA investment (state coastal resilience investment in LNS)
		2020	2:1 leverage on EPA investment

2021-2022 Proposed Work

Highlights of proposed new work for the coming year include:

- ***Implementing MassBays' CCMP.*** With ecosystem target conditions determined and approved by the Management Committee, we will push forward to work toward those targets, with programming and activities that are aligned with both local priorities and the dominant stressors and resources in the local system.

- ***Launching an online Ecohealth Tracking Tool.*** This task will also build on our work to set target conditions, serving as a visualization of our progress toward those conditions. This project will be funded in part by EPA's Exchange Network Program under our 2018 grant award.

- ***Reporting on factors that influence local priorities.*** UMass Boston researchers will complete their analysis of a series of deliberations among community members asked to consider ecosystem benefits provided by eelgrass, salt marshes, and tidal flats. Meanwhile, we will expand and update the EDA to include socioeconomic metrics to support response to those preferences and better serve EJ communities.

- ***New programming in environmental justice communities, and a new focus on diversity, equity, and inclusion.*** MassBays will direct its 2022-2023 Healthy Estuaries Grant Program toward efforts to improve environmental conditions in state-designated EJ communities. The ED and Metro Boston RC will lead an effort to identify concrete actions MassBays can take, and in Salem, the RSP will lead outreach to assist DCR in expanding the urban tree canopy.

- ***Launching AquaQAPP.*** This web-based application has been exhaustively tested and adjusted to respond to EPA and DEP needs. MassBays will provide training and support to monitoring groups to use the tool to plan their monitoring programs.

- ***New monitoring and research efforts to fill data gaps.*** These include documenting microplastics on Essex County beaches, real-time acidification data from Duxbury Bay, mapping die-off areas in the Great Marsh, and testing an eelgrass restoration based on seed planting in the Metro Boston region.

MassBays also has grants pending for two additional Bays-wide projects to advance CCMP implementation, which would be managed using §320 funds: 1) a NOAA Project of Special Merit to improve reliability and support more up-to-date mapping of eelgrass in Massachusetts waters, and 2) an EPA Exchange Network project to develop tools to help local monitoring groups improve data management practices, as well as analyze and share their data with multiple audiences.

Specific proposed MassBays-wide and regional tasks are described in ***Section C, New and Ongoing Projects***.

Staffing and Management

MassBays' Management Committee sets priorities for the program, and fosters partnerships for diverse engagement in our work. Committee members for the period July 1, 2019 through June 30, 2020 are listed in Attachment A.

Massachusetts Coastal Zone Management hosts MassBays (and Buzzards Bay NEP as well), providing in-kind technical and administrative support to MassBays. Fiscal management, GIS services, IT and HR support, and scientific expertise. In addition, access to photocopiers and printers, computers and software, and internet and phone services are provided while staff are onsite.

Executive Director Pam DiBona is responsible for the overall management of the program, including reports to EPA and other funders; staff supervision, including oversight of Regional Service Providers in line with contracts; and organizational development, including strategic planning and securing supplemental funding to implement the CCMP.

Staff Scientist Prassede Vella works 60 percent of her time with MassBays and 40 percent of her time with our host agency, CZM, as an Ocean Management Specialist. For MassBays, Prassede is responsible for coordination of the Healthy Estuaries Grant Program, staffs the Science and Technical Advisory Subcommittee to our Management Committee, and serves as technical expert for MassBays monitoring and reporting efforts.

Monitoring Program Circuit Rider Jill Carr works half-time with funding from EPA's Exchange Network Grant to provide hands-on, one-on-one technical assistance to community-based monitoring groups across the MassBays planning area. Her work advances our efforts to obtain new monitoring data to inform our State of the Bays reporting and prompt local action.

Regional Service Providers (RSPs) connect MassBays with planning area communities organized under five regions: Upper North Shore, Lower North Shore, Metro Boston, South Shore, and Cape Cod. Under cooperative grants from MassBays, each RSP designates a Regional Coordinator, in turn responsible for identifying regional priorities consistent with the outcomes articulated in the CCMP, and implementing an annual workplan at the local level. For FFY2021, the following organizations will serve in this capacity:

- Merrimack Valley Planning Commission (MVPC)/MassBays Upper North Shore Region
- Salem Sound Coastwatch (SSCW)/MassBays Lower North Shore Region
- Northeastern University Marine Science Center (NUMSC)/MassBays Metro Boston Region
- North and South Rivers Watershed Association (NSRWA)/MassBays South Shore Region
- Association to Preserve Cape Cod (APCC)/MassBays Cape Cod Region

Mystic River Watershed Association (MyRWA) is a designated Urban Waters Partner; MassBays will provide a subgrant to MyRWA to support the Mystic River Watershed Initiative and assistance to MassBays' RCs with engagement with EJ communities.

FFY2021 Budget Overview

A detailed budget request and narrative are included in ***Section D;*** a summary is included here:

Salary & fringe	$ 234,743
Travel	$ 5,256
Contractual	$ 28,534
Other Direct Costs	$ 493,835
Indirect	$ 27,632
Total Request	**$ 790,000**

B. Completed Major Projects and Activities (July 1, 2020 to June 30, 2021)

MassBays' Workplan for FFY2020 was guided by the Goals and Strategies of our Interim CCMP:

Goal 1. MassBays provides new resources to support research and management in the Bays.
- Strategy 1.1 Make new data available, especially to address gaps in knowledge
- Strategy 1.2 Support valid (QA/QC) data collection and use
- Strategy 1.3. Analyze and present existing data in multiple formats to document baselines and trends

Goal 2. MassBays reaches all planning-area municipalities with actionable information about coastal habitats
- Strategy 2.1 Support and conduct research to address gaps in knowledge and inform policy and actions regarding ecosystem conditions and functions
- Strategy 2.2 Provide education, training, and technical support; share case studies (successful and not); and support collaboration and cooperation on specific topics
- Strategy 2.3 Facilitate access to decision making forums, and increase influence on decision making by underserved communities

Goal 3. MassBays provides regular and locally informed State of the Bays reporting that reflects the unique characteristics of MassBays assessment units (embayments, rocky shore, barrier beach), and documents progress toward target conditions.
- Strategy 3.1 Establish target (improved) water quality and habitat conditions tied to desired uses and ecosystem services
- Strategy 3.2 Guide local action to expand habitat and improve water quality according to targets
- Strategy 3.3 Maintain MassBays' National Estuary Program status

Our work is closely aligned with the Clean Water Act Core Programs, which are:
1. establishing water quality standards
2. identifying polluted waters and developing plans to restore them (total maximum daily loads)
3. permitting discharges of pollutants from point sources (National Pollutant Discharge Elimination System permits)
4. addressing diffuse, nonpoint sources of pollution
5. protecting wetlands
6. protecting coastal waters through the National Estuary Program
7. protecting Large Aquatic Ecosystems.

The following list of accomplishments is organized according to the CCMP Strategies included in our 2019 Interim CCMP completed by June 30, 2021. Each project description includes the following:

Title
CWA core program: Per list (1-7) above
Objective: project-specific objective
Partners: Collaborators not directly funded by MassBays/§320 funds
Status: as of June 2021
Accomplishments and Deliverables: completed products

Strategy 1.1 Make new data available, especially to address gaps in knowledge

Title	**Implement MassBays Monitoring Plan (Central Staff)**
CWA Core Program	Protecting coastal waters through the National Estuary Program
Objective	Compile data sets for MassBays' delineated embayments, toward the goal of comprehensive and specific State of the Bays reporting.
Partners	STAC, DEP
Status	Year 1 pilot completed; contract renewed for the first monitoring year: 25 sites in Ipswich Bay.
Accomplishments and deliverables	
Implemented Year 1 of the MA Coastal Conditions Assessment (Year 2020 - Pilot)	Coordinated fieldwork including monthly survey (June-August) across all MA coast to assess coastal conditions. During Year 1 (Pilot Year), work included water quality monitoring, sediment quality monitoring and identification of benthic macroinvertebrates from 15 sites across Massachusetts. Sample analyses have been completed as well as QA/QC. The pilot year helped refinement of the protocol being used that will be implemented going forward (field and laboratory). It emphasized the importance of having the toxicity tests as well as the benthic data to better describe conditions for water impairment listing (DEP) and for State of the Bays reporting and decision-making (MassBays). Planning for Year 2 (25 sites) was initiated in the Spring in preparation for the field season.
Merrimack River Sampling Program Roundtable	MassBays convened more than 20 sampling coordinators from federal, state and community-based programs in a roundtable discussion to share findings and promote collaboration among groups working in the Merrimack River. The meeting resulted in increased awareness of individual programs and new connections made between those with similar goals and methods.

Title	**Investigate nutrients in Salem Sound (Central Staff, Lower North Shore)**
CWA Core Program	Protecting coastal waters through the National Estuary Program
Objective	Implement an investigation of water quality across the Sound that includes baseline monitoring as well as identification of hot spots.
Partners	CZM, SSU, ACASAK Technologies, CCS
Status	All sampling completed; final report to EPA will be submitted by September 2021
Accomplishments and deliverables	
Developed baseline data	Conducted monitoring according to approved QAPP in Danvers River and Salem Sound between July and September 2020. Gathered new baseline data for nutrients, sediment characterization, and benthic community structure in Salem Sound. Data (currently being analyzed) will demonstrate current conditions and help direct us towards next steps in developing a targeted program to track changes in these embayments in space and time. Draft report due in June 2021.

Title	**Investigate microplastics in Great Marsh waters (Upper North Shore)**
CWA Core Program	Protecting coastal waters through the National Estuary Program
Objective	Estimate the reach and degree of microplastic pollution in the water column.
Partners	BU, UNH
Status	2020 samples are with BU for analysis; development of a sampling protocol for beaches is underway.
Accomplishments and deliverables	
Developed baseline data to better understand conditions in Great Marsh waters.	With UNH, developed sampling collection protocol to use a manta net, and collected 24 samples for analysis by BU researchers Data (currently being analyzed) will describe current conditions and help direct us toward next steps. Draft report due in June 2021.

Title	**Monitor Cyanobacteria blooms (Cape Cod)**
CWA Core Program	Protecting coastal waters through the National Estuary Program; Identifying polluted waters and developing plans to restore them
Objective	Collect actionable information on harmful cyanobacteria blooms for the public and decisionmakers.
Partners	EPA, towns of Brewster, Chatham, Barnstable, Dennis, Yarmouth, MA Department of Public Health, MA DEP, MET
Status	Outreach efforts have increased visibility of the problem that exists in many CC ponds as documented by volunteer monitoring.
Accomplishments and deliverables	
Assessed two methods for estimating cyanobacteria concentration	Report of a pilot project completed in 2020 (see Attachment).
2020 Report on monitoring and findings	Final QAPP (developed as a transferable plan for other users) submitted for approval. Findings for 2020 were posted at APCC's interactive online map (https://apcc.org/our-work/science/community-science/cyanobacteria/)
Webpage and presentation for regional audiences	RC presented to BCCRS, Cyanobacteria Monitoring Collaborative; new webpage includes interactive online map of monitoring results (https://apcc.org/our-work/science/community-science/cyanobacteria/).

Title	Horseshoe Crab Spawning Surveys (South Shore)
CWA Core Program	Protecting coastal waters through the National Estuary Program
Objective	Conduct horseshoe crab spawning surveys in Duxbury Bay to assess the population
Partners	DMF, volunteers
Status	2020 data were submitted, 2021 surveys were conducted
Accomplishments and deliverables	
2020 field work	Data for the 2020 season were submitted to DMF.

Title	Marsh Edge Erosion Monitoring (Upper North Shore)
CWA Core Programs	Protecting wetlands
Objective	Determine the erosion/deposition status of marsh band and marsh edge in selected creeks and rivers of Plum Island Sound
Partners	BU
Status	Report on results to be delivered in FFY21
Accomplishments and deliverables	
Erosion monitoring conducted	Annual monitoring of selected location Marsh Edge Erosion sites throughout Essex Bay (6 sites) and Plum Island Sound (6 sites). Parameters measured include; the distance to edge change, type of bank face and height, structure of bank face and marsh peat integrity.

Title	Long-term Monitoring of Salt Marsh Vegetation Change (South Shore)
CWA Core Program	Protecting wetlands
Objective	Work with volunteers to monitor salt marsh vegetation changes through the Salt Marsh Sentinels program.
Partners	Private dock owners, volunteers
Status	2020 data compiled
Accomplishments and deliverables	
Training, monitoring, and reporting completed	Carried out two training sessions and conducted surveys along 14 docks. Report on findings completed June 2021 (see Attachment).

Title	**Publish salt marsh monitoring data from 2003-2015 (Cape Cod)**
CWA Core Program	Protecting wetlands
Objective	Compile results of a long-term data set consisting of pre- and post-restoration monitoring previously funded by DER.
Partners	DER
Status	Report with recommendations to be completed by end of FFY20
Accomplishments and deliverables	
Recommendations drafted	A draft report was provided to DER for review, then revised according to their comments. Major findings were that post-restoration monitoring of salt marshes should be conducted over a longer time frame (\5-10 years) as well as over a shorter-term (1-3 years); each restoration is unique; all 8 restored salt marshes experienced greater tidal flow which resulted in more salt marsh area becoming established. Tidal restoration effects on Phragmites varied, and our conclusion was that if removal of Phragmites is a goal, then other proactive and adaptive steps are needed to remove it (i.e., tidal restoration alone may not eliminate or reduce Phragmites).

Title	**Marine Invasive Species Monitoring (Upper North Shore, Lower North Shore)**
CWA Core Program	Protecting coastal waters through the National Estuary Program
Objective	Monitor established field sites for non-native species in cooperation with CZM
Partners	CZM, volunteers
Status	Monthly monitoring conducted June-October, 2020; data submitted to CZM
Accomplishments and deliverables	
Monitoring sites across MassBays' planning area	Volunteers were not part of this year's effort due to COVID restrictions, a subset of sites were monitored by RSP staff: 6 sites in LNS, 6 sites in UNS. SS did not participate this year.

Title	**Investigate Eelgrass Conditions in Duxbury-Kingston-Plymouth Bays (Central Staff, South Shore)**
CWA Core Program	Protecting coastal waters through the National Estuary Program
Objective	Implement a rapid assessment protocol to monitoring eelgrass extent and condition in Duxbury-Kingston-Plymouth Bays.
Partners	DMF
Status	No volunteers were recruited due to COVID restrictions; DMF conducted monitoring. Planning for Summer 2021 monitoring is underway.
Accomplishments and deliverables	
Status report completed	Technical report describing findings and including data (see Attachment)

Title	**Monitor Diadromous Fish Runs (South Shore, Cape Cod)**
CWA Core Program	Protecting coastal waters through the National Estuary Program
Objective	Provide local, state and federal fisheries managers with population estimates of river herring at monitored runs to inform protection, restoration and management efforts. Monitoring by volunteers also supports citizen stewardship of runs.
Partners	DMF, NOAA Fisheries, Herring River Network, citizen volunteers
Status	Data submitted for 2020 runs; 2021 counting efforts on the South Shore were adjusted to adapt to coronavirus concerns and restrictions on gatherings. While the Cape Cod RC was prepared to provide in-person training, the timing of a stay-at-home mandate required cancellation of the trainings.

Accomplishments and deliverables	
2020 Herring run results reported (SS, CC)	Results shared with volunteers and organizational members via newsletters; data submitted to DMF, though fewer sites were monitored in CC due to COVID restrictions.
Technology tapped to assist 2021 monitoring and analysis	SS RC worked with DMF to assess the 2021 pilot camera system in the South River, and replaced it for 2021. CC online reporting system now alerts the RC when data are submitted, improving response time.
2021 counts carried out	With information gleaned from a national webinar co-hosted by MassBays, CC RC prepared recommendations for counting herring during a pandemic, and provided it to the River Herring Network and to Cape Cod herring count groups (https://apcc.org/our-work/science/community-science/herring/). Eighty-two volunteers were trained for CC monitoring at 16 sites; 115 for 6 SS sites. After consultation with DMF, water/air temperature data were not collected at some sites to avoid sharing equipment (a COVID exposure concern).

Title	**Water quality monitoring (South Shore, Lower North Shore)**
CWA Core Program	Protecting coastal waters through the National Estuary Program; Identifying polluted waters and developing plans to restore them
Objective	Lead citizen monitoring in coastal waters to identify potential for remediation and source control.
Partners	EPA, MassDEP, municipalities
Status	2020 monitoring was constrained by restrictions due to the coronavirus; 2021 monitoring plans are in place.

Accomplishments and deliverables	
Riverwatch monitoring (SS)	Seven volunteers completed 8 sampling events over the course of the 2020 field season.
Clean Beaches & Streams and tributary monitoring (LNS)	Biweekly summer water testing for *Enterococcus* conducted at 18 sites; 2020 data were submitted to DEP for Integrated List assessments, uploaded to WQX, and displayed on SSCW's website (http://salemsound.org/CB&S.html)

Title	**Assess Coastal Acidification in Massachusetts (Central Staff, South Shore)**
CWA Core Program	Protecting coastal waters through the National Estuary Program
Objective	Assess coastal acidification conditions in Duxbury Bay.
Partners	EPA, NERACOOS, NECAN, GMRI, UMB, Town of Duxbury, volunteers, Seaside Sustainability
Status	MassBays' coastal acidification monitoring system is deployed and collecting continuous data. Central Staff and RCs continue engagement with state and regional entities investigating potential impacts and responses.
Accomplishments and deliverables	
Ocean acidification monitoring system developed and deployed in Duxbury Harbor	The system was deployed in Duxbury Harbor for testing in July 2020. The thermosalinograph had to be replaced to address an issue with salinity measurements. In addition, some updates were made by the manufacturer which caused some further delays (company was closed for an extended period during the 2020 season due to COVID-19). The system has been returned and is being prepared for re-deployment in April 2021. Volunteer training on system maintenance and sample collection was conducted in May 2021 with a plan to start sampling in June 2021. MassBays is working closely with EPA ORD Narragansett to make arrangements for discrete sample delivery and analyses. QAPP submitted to EPA for review.
Participated in NEP Coastal Acidification Network (CS)	Staff Scientist contributed to the report on coastal acidification published by EPA in May 2021.
Joined and supported the MA Ocean Acidification Commission (SS, LNS, CS)	South Shore RC was appointed to the Commonwealth's Ocean Acidification Commission established by the Massachusetts legislature in September 2018. A series of meetings were held during FFY2020 and South Shore RC participated in two of the three working groups. Staff Scientist worked with CZM to compile information on existing information/data and planned monitoring in MA, and to help develop the Commission's report and recommendations to the Legislature dated February 2021 (http://bitly.ws/dNyT) (MassBays' role is noted on pages 39, 42, 48, and 70).

Strategy 1.2 Support valid (QA/QC) data collection and use

Title	**Support for Citizen Science Monitoring Efforts**
CWA Core Program	Identifying polluted waters and developing plans to restore them
Objective	Increase the value and use of citizen monitoring data for decision making across the region.
Partners	Monitoring Coordinators Network, CSA Data Quality and Metadata Working Group, MassRivers Alliance, DEP, EPA EN, EPA Region 1, Eastern Research Group, UMCES-IAN
Status	AquaQAPP launched. One-on-one assistance to groups continues via Zoom, as well as engagement with regional and national efforts.
Accomplishments and deliverables	
AquaQAPP launched	Over several iterations, MassBays and ERG worked together to address beta-user feedback and finalize the coding of the tool, the behind-the-scenes Master QAPP, and the User Guide. A package of 27 digital field sheet templates was created to accompany generated QAPPs. A dedicated MassBays web link was created to centralize and house all AquaQAPP supporting files.
One-on-one tech support provided	The Circuit Rider has met one-on-one with 18 watershed groups to provide assistance this year. Services included help with data analysis (example here), data management, sampling plan design, QAPPs, outreach and training. Outreach to groups is conducted at least quarterly via the Monitoring Coordinators Newsletter, which includes grant information, training opportunities and other resources (example here). SS and CC RCs also provided assistance to local groups.
Training and workshops presented	This year, the Circuit Rider hosted several virtual workshops for citizen groups to increase awareness and use of WQX and related tools, including a hands-on workshop where groups were provided step by step instruction and technical support to upload data into WQX real-time.
WQX custom data import configurations drafted	Working with EPA and DEP, MassBays created a custom import configuration that can upload data in DEP's WPP "External Data Sources" format into WQX. Once finalized, this will help citizen science groups that use this data format to easily upload to WQX. Custom import configurations are also being created on a case-by-case basis to help groups deal with large volumes of historic data.
Proposal submitted under EPA EN 2021 RFP	*Leveraging Citizen Science Data to Improve Massachusetts Waters*; decision expected July 2021. Outcomes would include: additional quality data available to MassDEP and MassBays, broader and deeper capacity among local monitoring groups, and new tools shared across the Exchange Network.
Convened and facilitated a panel and discussion re: using citsci data for decision making	*Making all data matter: incorporating citizen science into decision making for improved water quality* was a real-time virtual session hosted 4/20/21 by MassBays and EPA Region 1, with four panelists (selected from among 11 submissions) presenting their approaches to incorporating "external" data into decision making. https://www.nalms.org/2021nmc/program/
Served on planning team for CitSci Virtual	ED participated in two steering committees (poster session and keynotes), to design and implement an interactive, month-long information exchange online. Reviewed and provided comments on 20 poster submissions, facilitated Q&A sessions for three plenary/keynote sessions.

Strategy 2.1 Support and conduct research to address gaps in knowledge and inform policy and actions regarding ecosystem conditions and functions

Title	**2020-2021 Healthy Estuaries Grant Program**
CWA Core Program	Protecting coastal waters through the National Estuary Program
Objective	Improve understanding and extent of data available across MassBays' planning area.
Partners	EPA, SSCW, CCS, MyRWA, MRWC
Status	Projects selected for funding are underway
Accomplishments and deliverables	
Awarded $95,000 to four grantees	MassBays administered the 3rd round of the grant (2020-2021). Technical support was provided as needed by the Regional Service Providers for projects in the respective regions. Projects covered a wide variety of topics and geographic area. For the award announcement refer here https://www.mass.gov/news/baker-polito-administration-awards-grants-to-improve-habitat-health-in-massachusetts-bays. The projects have been progressing in spite of the challenges posed by COVID in 2020 and deliverable and progress reports have been provided. Projects will be wrapped up during FFY21.

Title	**Assess Impacts of *Phragmites* Management Practices in the Great Marsh (Upper North Shore)**
CWA Core Program	Protecting wetlands
Objective	Determine progress regarding *Phragmites* removal in the Great Marsh, and investigate potential adverse impacts of repeated herbicide application.
Partners	BU
Status	Presence/absence of *Phragmites* and status of native marsh vegetation and benthic conditions assessed.
Accomplishments and deliverables	
Conducted drone surveys	Map produced for Salisbury marshes and additional presence/absence monitoring locations.
Compared treated to untreated sites	Subset of treated sites compared to controls for differences in vegetation and benthos, and results reported by BU. (See attachments)

Title	**Dam Removal Implementation and Monitoring: Peterson Pond, Veterans Memorial Park, Temple Street Dams (South Shore)**
CWA Core Programs	Protecting coastal waters through the National Estuary Program
Objective	Work with regional communities and other partners to assess feasibility and seek funding for removal of dams and other barriers and collect ecological data pre- and post-restoration
Partners	NOAA Fisheries, DER, Towns of Marshfield and Duxbury: dam removal project technical assistance and management
Status	Peterson Pond dam removed; progress continues on others
Accomplishments and deliverables	
Peterson Pond Dam removed	Construction completed in November 2020.
Temple Street Dam	Temple Street Dam hydrology study predicted potential downstream flooding; design for removal is underway.
Veterans Memorial Park Dam	Duxbury is moving ahead with design and permitting activities.

Strategy 2.2 Provide education, training, and technical support; share case studies (successful and not); and support collaboration and cooperation on specific topics

Title	**MassBays Science Walk (All regions)**
CWA Core Program	Protecting coastal waters through the National Estuary Program
Objective	To share information with diverse learners about research, monitoring, and restoration in the Bays, and the importance of estuaries
Partners	MIT Sea Grant, MyRWA, CCS, DMF, MOP, MRWC
Status	Consultant retained; vinyl banners presented along the Boston Harbor Walk during June, and shared on MassBays' website. Instructions prepared to facilitate similar walks (with the same posters) in the regions
Accomplishments and deliverables	
Expanded reach	Family-friendly banners presented in well-travelled public sites. Each poster included QR codes to facilitate more in-depth exploration.
Built capacity among partners	Consultant provided training and one-on-one support to leads on poster preparation, improving ability to communicate with public audiences.
Documented MassBays' contributions to work in the estuaries	The range of projects supported by MassBays was well-represented by the posters, and included two posters to bracket the walk describing MassBays and the importance of estuaries.

Title	**City Nature Challenge – Boston Area (Central Staff)**
CWA Core Program	Protecting coastal waters through the National Estuary Program
Objective	To engage diverse learners in watershed and increase awareness of beaches as coastal habitat
Partners	Brandeis University, New England Aquarium, Zoo New England, Earthwise Aware, Earthwatch Institute, Suffolk University
Status	International annual Challenge completed May, 2020. New MassBays iNaturalist project, #MassWrack, launched and ongoing.
Accomplishments and deliverables	
Expanded reach	#MassWrack reaches new audiences at a time when people are looking for meaningful ways to recreate and engage outdoors.
Supported partnerships	ED served on the steering committee, and hosted a "Daily Highlights" online public gathering during the event.
MassBays planning-area observations & observers documented	Developed and launched new project titled #MassWrack in September 2020 to document plant and animal species utilizing this under-studied coastal habitat.#MassWrack project page currently documents over 23,000 observations in the planning area.

Title	**Support municipal and regional actions that promote resilient coastal habitats and communities through the use of nature-based solutions (All regions)**
CWA Core Programs	Protecting wetlands
Objective	Work with partners and communities to encourage planning for climate change including stormwater management and adoption of adaptation measures that promote resilient coastal habitats, especially via nature-based solutions.
Partners	TTOR, Tufts, UNH, BU, Pew Foundation, MassAudubon, Northeast Coastal Coalition, LGCs, CCC, NOAA Restoration Center, WBNERR, CZM
Status	MassBays continues to be a key player in communication and outreach efforts, planning initiatives, and implementation of nature-based coastal management.
Accomplishments and deliverables *Climate resilience*	
Regional meetings, workshops, and lectures (All regions)	All RCs and Central Staff hosted and/or participated in events describing the impacts of climate change, especially regarding sea level rise and more frequent and severe storms. For example, the SS RSP convened a South Shore Climate Group, and presented information about coastal and ocean acidification during their December 2020 meeting; MB RSP presented at the MACC Fall 2020 conference (October 2020) re: identifying and implementing nature-based solutions in coastal communities.
Contributed to regional planning (All regions)	All RCs and Central Staff contributed to regional plans, including The Trustees' coastal strategy, North Shore Drought Management Committee, PIE-Rivers Steering Committee, Cape Cod and South Shore Conservation Agents' networks, etc. Several of these efforts resulted in applications for funding (listed above).
Proposed and convened a Convergence Accelerator for Coastal Sustainability (MB)	RSP participated in a national workshop held in April 2021 on Coastal Sustainability, and attended by nearly 200 people from diverse agencies and institutions, to discuss priorities for coastal sustainability and identify ways to facilitate nature-based solutions. The RSP is on the planning committee and has contributed to an NSF proposal, participatin in weekly meetings to design and refine this initiative.
Implemented coastal resilience grant (LNS)	RC was the Project Lead on Marblehead's CZM Coastal Resilience Grant titled "Increasing Resilience through Community Engagement: Facilitating Implementation of Climate Adaptation Strategies for Marblehead and its Harbor." Final deliverables are publicly available at http://salemsound.org/climateAdaptMH.html.
Devised a model local bylaw for climate change adaptation (CC)	RSP inventoried resources available to municipal conservation commissions to inform local bylaws re: climate adaptation; prepared a generic wetlands bylaw as well as a revised wetlands bylaw for Wellfleet based on anticipated local impacts.
Implemented Summer Teacher Institute (LNS)	RSP produced and delivered virtual and socially distanced training for teachers about climate change (June 2021), and call-back sessions (Winter 2020) for those earning graduate credit for their participation in June 2020. http://salemsound.org/School2Sea/S2SPDevelopment.html
Assisted with grant project scoping and applications (All regions)	All RSPs provided input and technical support to municipalities applying to climate change-focused grant programs, including EEA MVP, CZM Coastal Resilience, NSF Smart & Connected Communities,

Accomplishments and deliverables *Stormwater management*	
Advanced regional restoration planning efforts (CC)	The RC interviewed staff from nine Cape Cod Bay towns to identify timely stormwater management projects, and assisted Eastham with LID outreach and planning.
Reviewed and advised on municipal guidance	MassBays served on a review team for a consultant to DEP charged with developing a guidance document to support robust scoping and planning for projects under the S.319 grant.
Promoted and supported low-impact development	As the lead on the City of Salem's CZM-funded CPR grant, LNS RSP produced three training videos for DPW workers charged with maintenance of green infrastructure for stormwater management. Topics include rain gardens, high-performance biofiltration systems, catch basin inserts, and bioswales.
Supported municipal stormwater management actions (UNS, LNS, SS)	LNS and UNS RSPs carried out work through the Greenscapes program, which included 24 North Shore communities this year. Completed work includes: updating the program website and maintaining a public Facebook page, producing a virtual school program "Keeping Waters Clean" to support online learning during COVID, and providing MS4-specific outreach materials. UNS RSP convened and coordinated efforts of the Merrimack Valley Stormwater Collaborative, via monthly meetings, engagement in the state-wide Stormwater Advisory Committee, and updated webpage.
Accomplishments and deliverables *Habitat Restoration*	
Completed and maintained living shoreline (LNS)	Collins Cove Living Shoreline project (establishing a fringing marsh in Salem) was completed, and Arc-GIS story maps produced (one re: design and permitting, a second to cover construction, maintenance, and monitoring) to share lessons learned and best practices for future efforts, especially those in similarly dynamic coastal settings. More than 90 volunteers assisted with final plantings over one weekend in May 2021.
Launched multiple outreach and education platforms re: eelgrass (MB)	RC and the RSP produced: 1) *Seagrass genetic diversity and wasting disease activity* (online version) to teaches high school students how to genotype seagrass and identify disease lesions; aligned with Next Generation Science Standards, it includes a general introduction to seagrass, genetic diversity, and wasting disease, key definitions, step by step guidelines, and questions to prompt reflection and discussion, as well as a profile of the RC, allowing students to see an early career female scientist. https://evolutionworkshop.github.io/seagrass/ 2) *Seagrass Explorer*, a virtual seagrass aquarium for middle and high school students, featuring a series of signs and exhibits to explore via a game platform. Evaluation of the approach via pre- and post-game survey will reveal the effectiveness of the virtual platform for reaching diverse and remote students with scientific information. https://sites.google.com/northeastern.edu/seagrassexplorer/ 3) *Seagrass restoration story map* summarizes restoration efforts across Massachusetts based on a 2019 survey. https://storymaps.arcgis.com/stories/d65a1f83ff904893801fc804aea54438

Title	Presentations & Publications
CWA Core Programs	All
Objective	Share MassBays' findings, projects, and expertise with multiple audiences
Partners	multiple
Status	In spite of COVID, MassBays reached multiple audiences; because of the online nature of COVID-era conferences, we shared our work with international and national audiences previously out of reach.
Accomplishments and deliverables *Climate resilience*	
Central Staff outputs	*Presentations* "How's My Waterway? A demo with MassBays and EPA" 7/22/20, attended by watershed associations across Massachusetts. "Potential Presence of and Risks from COVID-19 in Wastewater and Beach Water" (9/29/2020) hosted by MassBays and UVM and attended by 135 participants across the country. "Private Docks of Salt Marsh or Eelgrass: Evaluating the Impacts" (10/24/2020), presented at the Massachusetts Association of Conservation Commissioners, reaching 38 coastal Commission members. "WQX Water Quality Exchange: Data Submittal Workshop" (1/5/21) attended by 11 NGO's and 10 state and federal data scientists. Attendees gained experience logging into WQX and submitting data via EPA template. "Making all data matter: incorporating citizen science into decision making for improved water quality" facilitated discussion at the National Water Quality Monitoring Conference (April 2021) "A cleaner Boston Harbor" presented during orientation for new UMB graduate students in the School for the Environment "Connecting environmental science & policy in Massachusetts" presented by SS and ED to an undergraduate lecture class at UMB (April 2021) *Publications:* Monitoring Coordinators' Network email newsletters and special editions published (07/20, 09/20, 11/20, 02/21, 06/21). "Accessing Community-based Monitoring Data for Decision Making," poster presented online through the RAE Summit (September 2020) https://drive.google.com/file/d/1IjyDoeiMtA3jleGbgumYTbr9N_0MFaHs/view "Setting local priorities for coastal habitat protection," fact sheet to describe the context and goals of multicriteria deliberations with local experts (November, 2020) https://drive.google.com/file/d/1wAoEVNJYK_3rBxXT_Ya4r2GJcQeJfzMR/view Logan, J., A. Boeri,J. Carr, T. Evans, E. Feeney, K. Ford, and K. Frew (2021) A review of the effects of small docks and floats on aquatic ecosystems and Best Management Practices for impact avoidance and minimization. (manuscript in review, Estuaries and Coasts). Stepenuck, K. and J. Carr (2021) Early impacts on and program adaptations of North American volunteer water monitoring programs resulting from COVID-19. (manuscript in review, PLOS One)

Upper North Shore outputs	*Presentations:* NWRS Conference: Connecting Science and Management Middlebury College: Great Marsh Virtual Tour and Restoration Activities Ditch Remediation Workshop Restore America's Estuaries: Great Marsh overview and partnerships, "Holistic Approach to Estuary-wide Restoration" MIT SeaGrant: Great Marsh Partnership Restoration Actions *Publications:* "Comparing Macroplastics Distribution using Drone Flights (Argilla Road and Pine Island)", August 2021 "Effects of a Large-scale Natural Sediment Deposition Event on Plant Cover in a Massachusetts Salt Marsh", January 2021 "Marsh Processes and their Response to Climate Change and Sea Level Rise", Annual Reviews, 2020 "Stormwater Pollution Prevention for Industrial Sites", Greenscapes, 2021 "Enhanced, Climate-Driven Sedimentation on Salt Marshes", Geophysical Research Letters, 2020 "Environmental Conditions of Phragmites australis and Effects of its Treatment", 2020 "Overview Report: Macroplastics Accumulation in the Great Marsh; Findings and a Blueprint for Action", 2020 "What Controls Marsh Edge Erosion?", Geomorphology, 2021 Storm and Wave Impacts to Joppa Flats and the Abutting Salt Marsh, 2020 Largest Marsh in New England near a Precipice, Geomorphology, 2021
Lower North Shore outputs	*Presentations:* "Private Docks Over Salt Marsh or Eelgrass: Evaluating the Impacts" MACC Fall Conference 10/24/2020 recorded "Climate Change - Think Big, Go Local" Salem State University 10/28/20 "Creating a Living Coastal Shoreline in Salem MA as We Enter the Climate Crisis", New England and Saint Lawrence Valley Geographical Society (NESTVAL) 11/14/20 recorded Resilient Cities Webinar: How are Beverly and Salem Preparing for Climate Change? 3/10/2021 recorded Beverly Water Street Sewer Pump Station and Beach Coastal Resilience Focus Group 3/22/21 Multiple presentations on Trees for Salem's Greening Gateway City program: 3/15, 3/23, 4/1, 5/26/21. Beverly Obear Park Coastal Resilience Public Forum 4/15/21 "Invasive Pepperweed; Finding and Removing it from our Shoreline" 4/27/21 Beverly Water Street Sewer Pump Station and Beach Coastal Resilience Public Forum 4/29/21

Metro Boston outputs	*Presentations:* • "Relationships among intraspecific diversity metrics in a coastal foundation species" T.C. Hanley gave a virtual, invited presentation on the importance of genetic diversity in saltmarsh and seagrass ecosystems at Ecological Society of America 105th Annual Meeting. (August 3-6, 2020) • "Social impacts and adaptive capacity in the New England groundfish fishery." J.H. Grabowski gave a webinar for Fisheries Partnership Support Services focused on the adaptive capacity of the New England groundfish fishery. (May 20, 2020) • "No Time to Waste: Invest Now in Living Shorelines." J.H. Grabowski gave a virtual presentation at the Massachusetts Association of Conservation Commissions (MACC) Fall 2020 Conference focused on identifying and implementing nature-based solutions in coastal cities. (October 17, 2020) *Publications:* • von Staats, D.A.*, **T.C. Hanley***, C.G. Hays, S.R. Madden, E.E. Sotka, and A.R. Hughes. 2021. "Intra-meadow variation in seagrass flowering phenology across depths." Estuaries and Coasts 44:325-388. https://doi.org/10.1007/s12237-020-00814-0 (*co-first author) • Hays, C.G., **T.C. Hanley**, R.M. Graves, F.R. Schenck, and A.R. Hughes. 2021. "Linking spatial patterns of adult and seed diversity across the depth gradient." Estuaries and Coasts 44:383-395 https://doi.org/10.1007/s12237-020-00813-1 • Piercey, R.S., P.E. Gribben, **T.C. Hanley**, A.T. Moles, and A.R. Hughes. 2021. "Incorporating marine macrophytes in plant-soil feedbacks: emerging evidence and opportunities to advance the field." Journal of Ecology 109:614-625 https://doi.org/10.1111/1365-2745.13536 • Whalen, M.A., R.D.B. Whippo, J.J. Stachowicz, P.H. York, E. Aiello, T. Alcoverro, A.H. Altieri, L. Benedetti-Cecchi, C. Bertolini, M. Bresch, F. Bulleri, P.E. Carnell, S. Cimon, R.M. Connolly, M. Cusson, M.S. Diskin, E. D'Souza, A.A.V. Flores, F.J. Fodrie, A.W.E. Galloway, L.C. Gaskins, O.J. Graham, **T.C. Hanley**, C.J. Henderson, C.M. Hereu, M. Hessing-Lewis, K.A. Hovel, B.B. Hughes, A.R. Hughes, K.M. Hultgren, H. Jänes, D.S. Janiak, L.N. Johnston, P. Jorgensen, B.P. Kelaher, C. Kruschel, B.S. Lanham, K.-S. Lee, J.S. Lefcheck, E. Lozano-Álvarez, P.I. Macreadie, Z.L. Monteith, N.E. O'Connor, A.D. Olds, J.K. O'Leary, C.J. Patrick, O. Pino, A.G.B. Poore, M.A. Rasheed, W.W. Raymond, K. Reiss, O.K. Rhoades, M.T. Robinson, P.G. Ross, F. Rossi, T.A. Schlacher, J. Seemann, B.R. Silliman, D.L. Smee, M. Thiel, R.K.F. Unsworth, B.I. van Tussenbroek, A. Vergés, M.E. Yeager, B.K. Yednock, S.L. Ziegler, and J.E. Duffy. 2020. "Climate drives the geography of marine consumption by changing predator communities." Proceedings of the National Academy of Sciences 117:28160-28166 https://doi-org/10.1073/pnas.2005255117 • **Grabowski, J.H.** and S.B. Scyphers. 2020. COVID-19 Special Investigation Report: Impacts to New England's Commercial Fisheries LINK • Aminpour, P., S.A. Gray, A. Singer, S.B. Scyphers, A.J. Jetter, R. Jordan, R. Murphy, Jr., and **J.H. Grabowski**. 2021. "The diversity bonus in pooling local knowledge about complex problems." Proceedings of the National Academy of Sciences 118:e2016887118 https://doi-org/10.1073/pnas.2016887118

	• McMahan, M.D., G.D. Sherwood, and **J.H. Grabowski**. 2020. "Geographic Variation in Life-History Traits of Black Sea Bass (*Centropristis striata*) During a Rapid Range Expansion." Frontiers in Marine Science 7:567758 https://doi.org/10.3389/fmars.2020.567758 • DeAngelis, B.M., A.E. Sutton-Grier, A. Colden, K.K. Arkema, C.J. Baillie, R.O. Bennett, J. Benoit, S. Blitch, A. Chtawin, A. Dausman, R.K. Gittman, H.S. Greening, J.R. Henkel, R. Houge, R. Howard, A.R. Hughes, J. Lowe, S.B. Scyphers, E.T. Sherwood, S. Westby, and **J.H. Grabowski**. 2020. "Social Factors Key to Landscape-Scale Coastal Restoration: Lessons Learned from Three U.S. Case Studies." Sustainability 12:869 https://doi.org/10.3390/su12030869
South Shore outputs	*Presentations:* Weathering the 2020 Drought, 8/18/2020 Ocean Acidification Scientific Literature Review Subcommittee Summary Report, 9/18/20 Ocean and Coastal Acidification, 12/10/20 Winter Beachcombing, 1/27/21 Girl Scouts of Eastern Mass STEM Conference - All About Estuaries, 3/20/21 River Herring Network Webinar - Counting During COVID 3/29/21 *Publications:* 2020 River Herring Data Summary, August 2020, NSRWA E-News Monitoring Ocean and Coastal Acidification, September 2020, NSRWA Newsletter New Regulations for Shellfish Beds near WWTPs , November 2020, NSRWA E-News Peterson Pond Dam Removal Timeline, December 2020, NSRWA E-News MassBays Restoration Partners, March 2021, NSRWA Newsletter Judith Pederson, James T. Carlton, Carolina Bastidas, Andrew David, Sara Grady, Lindsay Green-Gavrielidis, Niels-Viggo Hobbs, Cristina Kennedy, Jennifer Knack, Megan McCuller, Brandon O'Brien, Kristin Osborne, Sabrina Pankey and Thomas Trott. 2021. 2019 Rapid Assessment Survey of marine bioinvasions of southern New England and New York, USA, with an overview of new records and range expansions. Bioinvasions Records pp 227-237.

Cape Cod outputs	Presentations: "Dynamics of a Coastal Salt Pond." Siders Pond neighborhood association. 2/11/21. Cedar Lake: Water Quality Issues and Monitoring Approaches. Cedar Lake neighborhood association. 2/24/21. "Conducting Herring Counts During a Pandemic" River Herring Network (2/23/21). "Volunteer Herring Counts: the Why and How." Friends of Herring River (3/20/21), Town of Mashpee (3/27/21), Red Lily Pond Project (3/23/21), Town of Dennis (3/31/21) Publications: 2020 State of the Waters: Cape Cod: 2020 Cape Cod Water Health Report and Action Plan. 10/16/20. Cape Cod Salt Marsh Restoration: Results of 2003 - 2020 APCC Salt Marsh Monitoring Program, draft report, January 2021. 2020 Cyanobacteria Monitoring Reports: Baker, Cliff, Cobbs, Elbow, Griffiths, Long, Lower Mill, Myricks, Schoolhouse, Sheep, Smalls, Upper Mill, and Walkers Ponds, Brewster, MA.2/22/21. Seymours Pond, Brewster, MA. 2/23/21. Duck, Dyer, Great, Gull, Higgins, and Long Ponds, Wellfleet, MA. 2/5/21. Cedar Lake, Crooked Pond, Deep Pond, Jenkisn Pond, and Mares Pond, Falmouth, MA. 2/22/21. Flax Pond, Falmouth, MA. 2/22/21. Hamblin, Middle, and Mystic Ponds, Barnstable, MA. 1/7/21. Long Pond, Marstons Mills, Barnstable, MA. 2/12/21. Oyster Pond, Falmouth, MA. 2/22/21. Duck, Dyer, Great, Gull, Higgins and Long Ponds, Wellfleet, MA. 2/5/21. 2020 Cyanobacteria Monitoring Report: Cedar Lake, Crooked Pond, Deep Pond, Jenkins Pond, and Mares Pond, Falmouth, MA. 2/22/21. Flax Pond, Falmouth, MA. 2/22/21 Long Pond Marstons Mills, Barnstable, MA. 2/12/21. Oyster Pond, Falmouth, MA. 2/22/21.

Strategy 2.3 Facilitate access to decision making forums, and increase influence on decision making by underserved communities

Title	**Increasing awareness of environmental justice issues**
CWA Core Program	Protecting coastal waters through the National Estuary Program
Description/Objective	Highlighting local examples of inequitable distribution of adverse and beneficial environmental impacts for multiple audiences
Partners	WAA, NOAA, Mashpee Wampanoag tribe, UMB, SSL, Wellesley College,
Status	Multiple events hosted/attended, efforts expected to increase over time
Accomplishments and deliverables	
Convened regional workshop series (SS)	RC served on planning committee and emceed three workshops hosted by WAA with sponsorship from MassBays. Topics included an introduction to EJ, supporting public access to recreational waters, and promoting EJ; recording and materials available at https://watershedaction.org/2021-conference.
Launched Talking Trash for Clean Oceans	High school interns – 11 students from Salem Public Schools and Girls Inc. of Lynn – conceived of and led community service projects to address marine debris. FFY20 efforts culminated in a community lecture presented online by the students.
Hosted high school marine science symposium (MB)	RC served on the steering committee, attending monthly planning meetings, designed an asynchronous activity, and moderating a synchronous event for the virtual, week-long event held in March 2021. https://www.massachusettsmarineeducators.org/high-school-marine-science-symposium
Provided herring count training to tribal community (CC)	RC interviewed Mashpee Wampanoag community representatives to determine needs for assistance, and responded with training for the tribal community on counting herring in Mashpee waters. The tribal Natural Resources Officer was a presenter during the training, held in March 2021 for 12 participants.
Supported regional collaborative efforts to advance diversity, equity, and inclusion in marine science (MB, Central Staff)	. RC and ED participated in a training offered by AWOC Space and sponsored in part by MassBays, "Creating Space for Women of Color in Marine Science." Both subsequently joined the nascent Massachusetts Marine Science Collective and serve as moderators for a listserv intended to facilitate access to jobs, internships, and funding opportunities for diverse candidates.
Engaged in national- and state-level planning and assessment of DEI/EJ efforts (MB, Central Staff)	ED co-chaired, and RC participated in an NEP-EPA working group for mutual support and information exchange about effective approaches and tools for increasing DEI (and EJ awareness) within NEP structures and programming. Provided an overview of MassBays' goals for EJ and inclusion as part of a state-wide assessment (https://drive.google.com/file/d/1v7xmEb4zQhYqtPBi2dMa8ZDPswn3Nd5c/view).

Strategy 3.1 Establish target (improved) water quality and habitat conditions tied to desired uses and ecosystem services

Title	**Development of a Biological Condition Gradient Framework for Estuaries in MassBays. (Central Staff)**
CWA Core Program	Protecting coastal waters through the National Estuary Program
Objective	With funding and strong technical support from EPA ORD/Narragansett, EPA HQ/OST, and EPA Region 1, MassBays will develop a BCG framework to set and measure progress towards targets for improvement in estuarine ecosystem conditions.
Partners	STAC, EPA Region 1, EPA ORD, EPA OST
Status	Habitat-based targets identified and endorsed by the MC, metrics proposed for tracking progress toward the targets.
Accomplishments and deliverables	
Used embayment ecotypes to inform final BCG	Using ecotypes that draw parallels across MassBays' embayments as a frame, staff worked with EPA to refine BCGs for each; ORD presented draft final BCGs (with historical and current data) for eelgrass, salt marsh and tidal flats to RCs for input.
Devised target habitat conditions	EPA and MassBays staff worked closely with STAC subgroups focused on salt marsh, eelgrass, and tidal flats, and ultimately with the full STAC to develop draft targets derived from the ecotype-specific BCGs. These were presented to the MC in June 2021 for endorsement and consideration as part of the final CCMP.

Strategy 3.2 Guide local action to expand habitat and improve water quality according to targets

Title	**Development of a Ecosystem Services Gradient Framework for Estuaries in MassBays (Central Staff)**
CWA Core Program	Protecting coastal waters through the National Estuary Program
Objective	MassBays will employ an ESG framework to communicate about and encourage local action towards targets for improvement in estuarine ecosystem conditions.
Partners	STAC, EPA Region 1, EPA ORD, EPA OST, UMB
Status	ESG components were identified by EPA and MassBays staff, and vetted by the RCs; results of stakeholder (local expert) workshops conducted by UMB are in preparation. The outcomes will inform education and outreach regarding targets devised using the BCG framework.
Accomplishments and deliverables	
Implemented workshops to determine local priorities	Researchers from UMB employed a multi-criteria deliberative process to engage "local experts" in prioritizing ecosystem benefits (indicated by water quality, fish abundance, shellfish landings, and carbon uptake), derived from habitats (salt marsh, eelgrass, and tidal flats) in their communities' embayments. Four workshops (to correspond with the four stressor-resource categories defined via PCA analysis in FFY2019) were held in December 2020 via Zoom. Preliminary results were shared with STAC and EPA to inform ESG discussions.
Incorporated ESG into CCMP implementation planning	EPA worked with MassBays staff and RCs to identify the suite of ecosystems services that these three habitats provide in MassBays' planning area, along with associated metrics. Taken with results of the workshops conducted by UMB, this information will inform future actions, outreach, and technical support to implement the CCMP and meet targets.

C. New and Ongoing Projects (July 1, 2021 to June 30, 2022)

Strategies and Outcomes

MassBays' work over the coming year will implement components of our Interim CCMP and contribute to the following Outcomes:

A. Sustainable NEP
B. Improved habitat continuity and restored hydrology
C. Improved water quality
D. Resilient coastal habitat, including nature-based coastal protection
E. Restored natural communities
F. Robust interagency and interdisciplinary collaboration and partnerships
G. Well-informed, multisector input to decision making which includes underserved communities

Our proposed work with funding under Federal Fiscal Year 2021 is aligned with and driven by the following Goals and Strategies described in the CCMP:

Goal 1. MassBays provides new resources to support research and management in the Bays.
Strategy 1.1 Address data gaps
Strategy 1.2 Support valid (QA/QC) data collection and use

Goal 2. MassBays reaches all planning-area municipalities with actionable information about coastal habitats
Strategy 2.1 Support research to inform policy and actions
Strategy 2.2 Technical support and communications
Strategy 2.3 Increase influence of underserved communities on decision making

Goal 3. MassBays provides regular and locally informed State of the Bays reporting that reflects the unique characteristics of MassBays assessment units (embayments, rocky shore, barrier beach), and documents progress toward target conditions.
Strategy 3.1 Establish target conditions
Strategy 3.2 Guide local action for expanded habitat and improved water quality

Our proposed tasks are also closely related to the Clean Water Act Core Programs, which are:
(1) establishing water quality standards
(2) identifying polluted waters and developing plans to restore them (total maximum daily loads)
(3) permitting discharges of pollutants from point sources (National Pollutant Discharge Elimination System permits)
(4) addressing diffuse, nonpoint sources of pollution
(5) protecting wetlands
(6) protecting coastal waters through the National Estuary Program
(7) protecting Large Aquatic Ecosystems.

The figures below depict estimates of the Level of Effort (LOE) to be expended toward each Strategy. The division of labor between the Boston office (Central Staff) and regional partners (RSPs) is evident when the two are compared. During the coming year, Central Staff (see Figure 2) will focus on making sure the supports for implementing our CCMP are in place – leading the effort to set targets, ensuring the availability of valid data relevant to those targets, and devising strategies and securing funding to work toward those targets at the planning-area level. RSPs (Figure 3) are focused on local implementation and progress toward improved habitat and water quality conditions, through data gathering and direct support in local communities. Our cumulative efforts will help us make strides toward meeting the Goals of our CCMP.

Figure 2. *Central Staff (salary, fringe, and indirect charges) expenditures predicted for FFY2021. This includes funding from the 2018-2021 EPA Exchange Network award (Strategy 1.2) and the pending Project of Special Merit grant from NOAA (Strategy 2.1) to support work of the Coastal Monitoring Circuit Rider.*

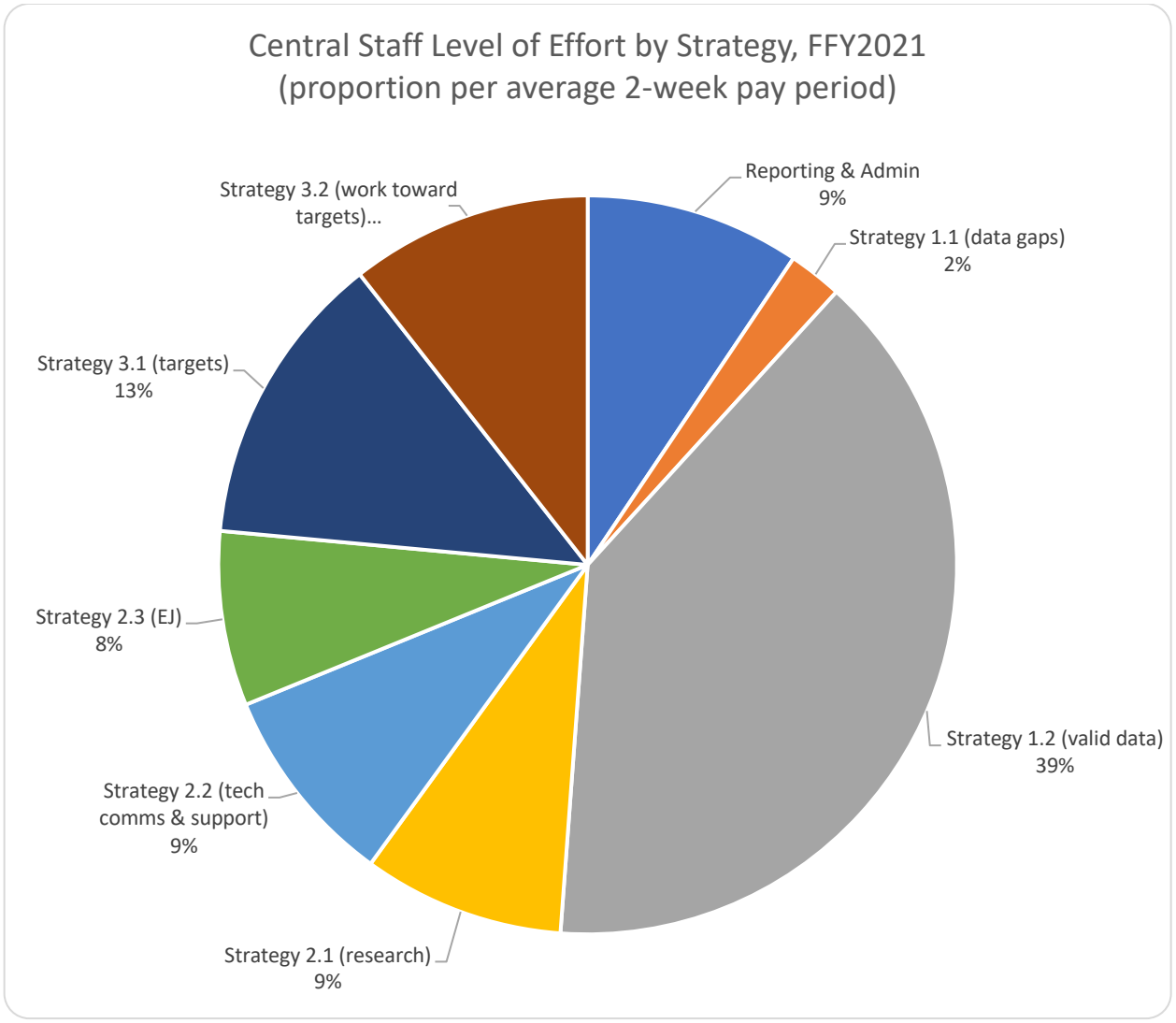
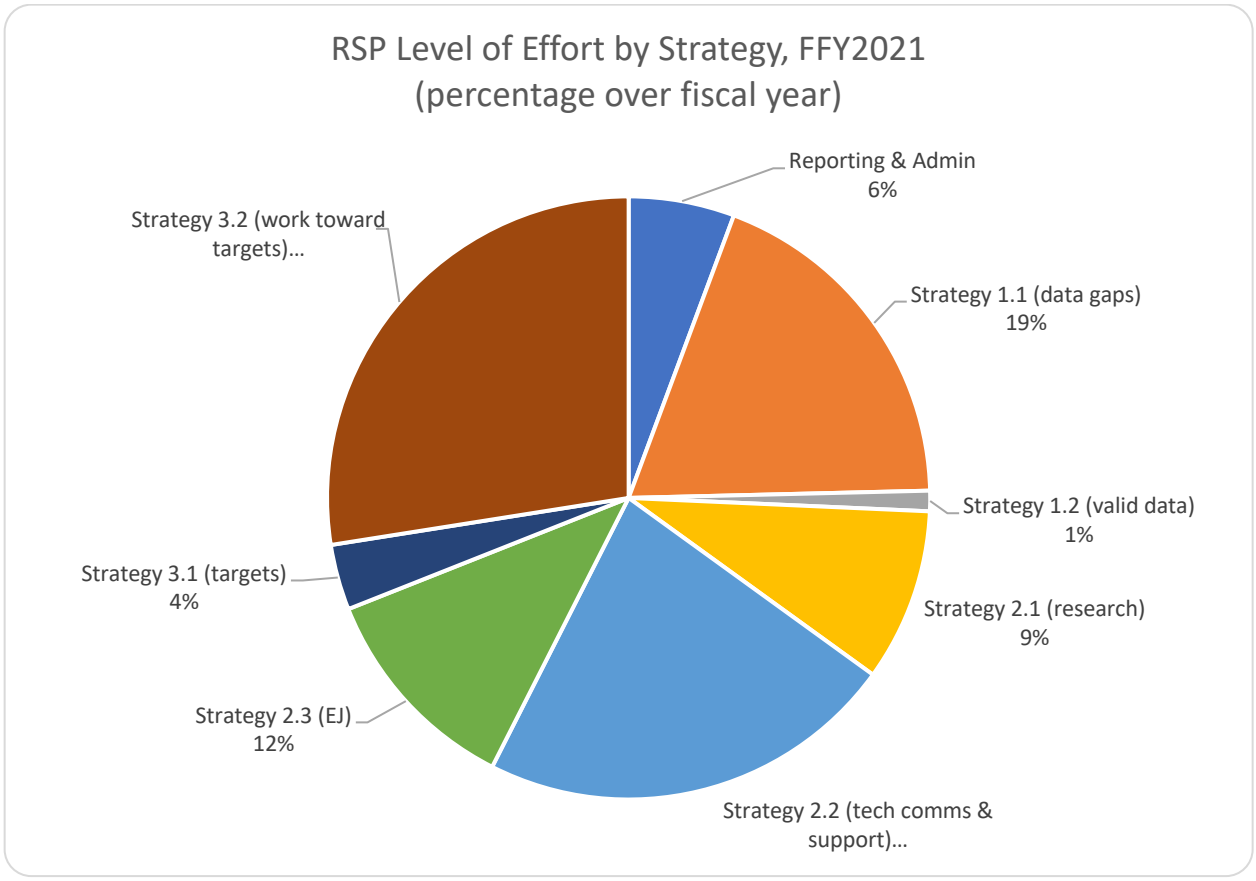


Figure 3. *Regional Coordinator LOE allocated from RSP Grant funds ($63,000 distributed per region) to each strategy.*



The table of proposed activities below includes the following:

Title (Region), Budget/LOE: Activity name and MassBays geographic region in which it will be carried out, and non-s.320 funding and/or RC LOE (for region-specific projects)
Description: Status (New or Ongoing), project activities and objectives
CWA Core Program: Per list (1-7) above
CCMP Outcome: Per list (A-G) above
Partners: Collaborators not directly funded by MassBays/§320 funds
Timeline & Deliverables: Product(s) expected, and the quarter (Q1-Q4) projected for their completion

Strategy 1.1: Make new data available, especially to address specific gaps in knowledge

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Monitor Cyanobacteria blooms (Cape Cod) $7269 + 180h	***Ongoing*** Since FY18 APCC has been monitoring cyanobacteria in lakes and ponds that discharge to estuaries and serve as diadromous fish spawning habitat to provide useful actionable information on harmful cyanobacteria blooms for the public and decisionmakers. To date, nearly 40 ponds have been monitored; results are expressed in terms of Low, Moderate, or High risk. APCC's FFY21 goal is to monitor 100+ ponds across the Cape and in all 15 towns through partnerships with Barnstable County and volunteers, though COVID restrictions will limit the number of volunteers. ***New*** A Cyanobacteria Action Network will investigate the transport of cyanotoxin to estuaries via juvenile herring outmigration.	(2) Identifying polluted waters and developing plans to restore them; (6) Protecting coastal waters through the National Estuary Program (C) Improved water quality (F) Robust interagency and interdisciplinary collaboration and partnerships	MET; EPA; UNH; Limtex, Inc.; Barnstable County Dept of Health and Environment; Towns of Brewster, Barnstable, Dennis, Eastham, Falmouth, Mashpee, Wellfleet, Yarmouth; Cape Cod National Seashore; Martha's Vineyard Commission; and local ngos.	(Q4) List of training sessions, number of participants, training materials, Train and supervise staff and interns re: protocol, collect and analyze data, (Q1-4) Outreach and education including updates to the APCC Cyanobacteria Monitoring Program webpage and interactive map of results, (Q4) Report monitoring results with annual summary, (Q1) Research plan for examining transport of cyanobacteria and cyanotoxins, (Q4) Draft report on results of research
Macro and Microplastics Sampling (Upper North Shore) $60,000, 95h	***New*** Conduct monitoring for microplastics in the sand of beaches along the Merrimack River, Plum Island Sound, Essex Bay, and Annisquam River; develop a detailed sampling program for future efforts ***Ongoing*** Conduct focused sampling in the waters of the Great Marsh informed by FFY20 results.	(4) Addressing diffuse, nonpoint sources of pollutants (C) Improved water quality	Seaside Sustainability, UNH, Northern Essex Community College, Governors Academy, ETGM	(Q1) Sampling at the high tide line carried out on Essex County beaches, (Q2) Reports on results from sampling in both settings, (Q4) Draft transferable design for ongoing beach monitoring, (Q4) Revised sampling plan for rivers and outfalls

Strategy 1.1 *continued*

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Monitor diadromous fish runs (South Shore, Cape Cod) $15,300 + 200h SS $5654 + 140h CC	***Ongoing*** Provide local, state and federal fisheries managers with population estimates of river herring at monitored runs to inform protection, restoration and management efforts. Monitoring by volunteers also supports citizen stewardship of runs. RCs will support citizen monitoring of fish runs by providing partners and volunteers with training, data management, QA/QC, reporting, and other assistance. ***New*** Support Fish School herring outreach program with observations via a camera in South River. (SS)	(6) Protecting coastal waters through the National Estuary Program (B) Improved habitat continuity and restored hydrology	DMF; NOAA; River Herring Network; South Shore towns; CCCD towns of Barnstable, Brewster, Chatham, Dennis, Eastham, Falmouth, Harwich, Mashpee, Orleans, Sandwich, Wellfleet, Yarmouth; local ngos	(Q2) Participate in River Herring Network conference in Fall (and/or other events as held), (Q4) Number of participants in Spring 2022 training sessions for volunteers, outreach materials; (Q1) Final data report for Spring 2021 herring counts submitted to DMF, (Q4) Report on volunteer efforts for Spring 2022 herring counts, (Q3) Outreach materials used to engage students with South River camera, (Q4) Synthesis report of Cape Cod herring count data for 2001-2021

Strategy 1.1 *continued*

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Lower Merrimack River Initiative (Upper North Shore) $25,000 + 120h	***New*** Focused assessment of a variety of conditions and restoration activities in the lower Merrimack River including: 1. investigation of eelgrass restoration potential in Joppa Flats and Black Rock Creek and pilot site development 2. restoration of native marsh vegetation through the removal of invasive plants (pepperweed, Phragmites [pending FFY20 deliverable]) 3. ground truthing marsh die-off as a result of SLR in marshes of the Merrimack River 4. microplastic sampling and potential microplastic cleanup in the lower Merrimack River 5. investigation into anadromous fish restoration in the Merrimack River and its tributaries.	(2) Identifying polluted waters and developing plans to restore them (5) Protecting wetlands (B) Improved habitat continuity and restored hydrology	Seaside Sustainability, UNH, MassAudubon, USFWS, BU, ETGM LGC, Volunteers, Salisbury/Newbury/ Newburyport, and EJ communities of the lower Merrimack, including Lawrence and Haverhill	(Q1) Microplastic sampling results and recommendations, (Q3) Map of investigated locations and photos of pilot eelgrass restoration sites (Q4) Map of invasives treatment sites, (Q3) Map of die-off areas and potholes identified in lower Merrimack River salt marshes, (Q2-Q3) convene a working group and identify anadromous fish restoration opportunities
Water quality monitoring (South Shore) $10,747 + 150h	***Ongoing*** Citizen monitoring in coastal waters to identify potential for remediation and source control, through the Riverwatch program in the North and South Rivers and the DKP Water Quality Monitoring Program; ***New*** Conduct bacterial source tracking in North River Headwaters with Town of Hanover (pending funding); ***New (pending funding)*** Monitor eDNA and PFAS to assess impacts to coastal biodiversity with Jones River Watershed Association.	(2) Identifying polluted waters and developing plans to restore them (C) Improved water quality	Volunteers; Towns of Duxbury, Kingston, Plymouth, and Hanover; JRWA	(Q1) Riverwatch volunteer monitoring completed, (Q2) Monitoring plan for DKP, (Q3) DKP monitoring results, (Q1-Q4) Monthly sampling results from eDNA/PFAS monitoring

Strategy 1.1 *continued*

Water Monitoring Program: Clean Beaches & Streams and Upstream Tributary Sampling (Lower North Shore) $10,000 +52h	***Ongoing*** Identify sources of pathogen pollution to Massachusetts' waters, specifically Salem Sound and its tributaries, particularly illicit sewage discharges and faulty sewer and stormwater systems, and promote their remediation. Activities include biweekly summer water testing for *Enterococcus* at outfalls and streams, and sharing data with municipal staff to prompt action.	(2) Identifying polluted waters and developing plans to restore them (C) Improved water quality	Manchester Coastal Stream Team, Volunteers, DMF, EPA, DEP	(Q1) Report on bacterial levels for 15 - 18 outfalls or streams, results published on SSCW website, (Q2) data uploaded to WQX, (Q1-4) List of remediation actions taken up by municipalities.
Coastal Acidification Monitoring and Management (Central Staff, South Shore) $750 + 50h SS	***New (postponed from 2020)*** Monitor coastal acidification conditions in Duxbury Bay, a hotspot for shellfish aquaculture industry in Massachusetts. Volunteers will be trained by UMB and SS RC. Monthly samples will be collected by SS RC and volunteers for analysis of TA and DIC by EPA ORD (Narragansett Lab)	(6) Protecting coastal waters through the National Estuary Program (C) Improved water quality	Town of Duxbury, UMB, EPA, Volunteers	(Q1) QAPP for discrete sample collection (CS), (Q2) Training manual, list of volunteers trained to maintain CA logger and maintenance log, (Q2) Protocol for QA/QC of real-time data. (Q1-4) Monthly discrete samples collected at low and high tide, with concurrent outreach about coastal acidification and its impacts, (Q4) First technical report

Strategy 1.1 *continued*

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Assessing Coastal Acidification (Lower North Shore) $2000 + 52h	***Ongoing*** Conduct citizen monitoring program to document pH, temperature and salinity in pore water in Salem Sound mudflats, host and present outreach education to students, teachers (via a Teacher Institute on Climate Change), and the public, and participate in NOAA and EPA OCA Networks, NECAN, and other relevant groups	(6) Protecting coastal waters through the National Estuary Program (C) Improved water quality	NECAN, EPA, MIT Sea Grant, SSCW volunteers	(Q1) monitoring carried out, (Q4) list of lectures and presentations provided, including engagement via Teacher Institute, (Q4) report on participation in regional efforts
Monitoring Long-term Salt Marsh Vegetation Change (South Shore) 125h	***Ongoing*** Work with volunteers to monitor salt marsh vegetation changes through the Salt Marsh Sentinels program; participate in the Massachusetts Salt Marsh Working Group and its Sea Level Rise Subcommittee	(5) Protecting wetlands (D) Resilient coastal habitat, including nature-based coastal protection	Dock owners, UMass Amherst	(Q2) Report on findings and project participation of dock owners in collection of salt marsh data, (Q1-4) Report on dates and priority actions developed by the Working Group and Subcommittee
Map Sea Level Rise-induced marsh platform die-off areas (Upper North Shore) $12,000 + 60h	***New*** Increased inundation from SLR is evidenced by small vegetation die-off areas where impounded water on the marsh platform accumulates due to differences in marsh elevation. Mapping these areas as well as ground-truthing UAV (drone) imagery will be performed where die-off has been observed.	(5) Protecting wetlands (B) Improved habitat continuity and restored hydrology	UNH, drone contractor, 8TGM	(Q1) drone imagery, (Q3) field verified mapping of marsh die-off due to inundation
Horseshoe Crab Spawning Surveys (South Shore) $2300 + 75h	***Ongoing*** Conduct horseshoe crab spawning surveys in Duxbury Bay to assess the population	(7) Protecting large aquatic ecosystems (E) Restored natural communities	DMF, Town of Duxbury, Duxbury Beach Reservation Inc.	(Q1) 2021 data submitted to DMF (Q4) 2022 surveys completed with volunteers

Strategy 1.1 *continued*

Title (Region) , Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Monitoring Marine Invasive Species (North and South Shore) $1000 + 52h LNS $1800 + 25h UNS $1200 + 25h SS	***Ongoing*** Monitor established field sites for non-native species in cooperation with CZM's MIMIC program, conduct training for monthly monitoring from July to October 2021 and May to June 2022, and share results with CZM and the public. LNS also monitors settle plates at the Beverly Pier to understand fouling organisms.	(7) Protecting large aquatic ecosystems (E) Restored Natural Communities	CZM, 8TGM, Volunteers	(Q1, Q4) number of volunteers trained per season (Q2) data submitted to CZM, along with photodocumentation of Beverly Pier settle plate fouling, (Q4) list of presentations and publications
Monitoring and Mapping of Invasive Phragmites in the Great Marsh (Upper North Shore) $5,000 + 60h	***Ongoing*** Invasive Phragmites in the open marsh in east Salisbury marsh, northern Plum Island Sound, and along the marshes of the Plum Island River will be mapped to define the effectiveness of previous Phragmites management practices. Nine established treatment and monitoring locations will be surveyed, and a subset also assessed in terms of resiliency of native marsh vegetation and the benthic community following treatment.	(5) Protecting wetlands (E) Restored Natural Communities	PRNWR, BU, 8TGM	(Q3) Year 2 report on impact of Phragmites treatment, including: • photo documentation and maps of previously treated areas with current status • assessment of effectiveness of treatment practices and impacts on the marsh ecosystem • recommendations regarding continued pesticide application

Strategy 1.1 *continued*

Title (Region) , Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Water Quality and Benthic Communities Monitoring in Salem Sound (Central Staff, Lower North Shore) $2,000 + 40h	***Ongoing*** implement July-September monthly nutrient monitoring and benthic community assessment program in Salem Sound.	(6) Protecting coastal waters through the National Estuary Program (C) Improved water quality	CZM, SSU, volunteers	(Q3) Technical report presenting results and management recommendations (with CS); (Q4) list of presentations and publications
Massachusetts Coastal Condition Assessment (Central Staff) $150,000	***Ongoing*** Manage water quality, sediment, and benthic monitoring survey in the near-shore of Massachusetts over the time period 2020-2023. Parameters include measures of water quality, sediment quality and benthic communities from a total of 90 sites (25 sites on the North Shore in 2021). The data serves to inform MassBays' State of the Bays reporting under CWA §320 and DEP's required reporting under CWA §109.	(2) Identifying polluted waters and developing plans to restore them (C) Improved water quality	DEP, STAC, Normandeau Consultants	(Q4) Year 2 technical interim report including 2021 data, (Q3) Amended contract and scope for Year 3 (2022) monitoring
Healthy Estuaries Grant (Central Staff, All Regions) $(70,000)	***Ongoing*** MassBays will support and close out the 3rd round of the grant (2020-2021). Technical support will be provided as needed by the RSPs for projects in their respective regions. A 4th round (2022-2023) will be announced.	(6) Protecting coastal waters through the National Estuary Program All CCMP outcomes	MRWC, CCS, MyRWA, SSCW	(Q2) Webpage for each project on massbays.org, to incude final reports from each grantee, (Q3) 2022-2023 grant RFR submitted to EEA for posting, (Q4) Award recommendations submitted to EEA

Strategy 1.2 Support valid (QA/QC) data collection and use

Task Title (Region) , Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Support use of AquaQAPP and data upload to WQX (Central Staff, All Regions) $30,000	***New*** Support monitoring groups in the use of online QAPP generator AquaQAPP, ***Ongoing*** Increase accessibility to new and historic data generated by watershed groups by providing training and support to facilitate data upload to EPA's WQX framework	(2) Identifying polluted waters and developing plans to restore them (6) Protecting coastal waters through the National Estuary Program (C) Improved water quality	EPA Exchange Network, EPA Region 1, DEP, Citizen Science Association, Coastal Monitoring Coordinators' Network	(Q1) Final application released, (Q1, Q2) AquaQAPP outreach and training materials, (Q4) List of groups supported via training, materials, and one-on-one support for either effort, (Q3) Citizen data are integrated into MassBays' Strategic Monitoring Plan implementation, (Q4) Citizen data are highlighted via the State of the Bays/ecosystem tracking system visualization
Build technical capacity for data analysis and visualization (Central Staff) $89,488 (EPA Exchange Network funds)	***New*** Coordinate with new MassDEP External Data Coordinator to offer trainings on quality control documentation, and making data usable by regulators; ***New (pending funding)*** Develop R-based packages for data QC, analysis and visualizations; and host beta testing and training sessions.	(6) Protecting coastal waters through the National Estuary Program (C) Improved water quality	EPA Exchange Network, DEP	(Q3) Outcomes from project kickoff, list of participants, (Q4) data QC training materials, list of events, and list of one-on-one support services provided, (Q4) results of beta-testing for R-based packages

Strategy 1.2 *continued*

Engage local and regional K-12 teachers and students in student-centered community science to assess water quality, biodiversity, and invasive species in New England coastal ecosystem (Metro Boston) $3500, 80h	***New (pending funding)*** collaborative, community science project engaging K-12 teachers and students in monitoring of water quality, invasive species, and species diversity in New England coastal waterways – NOAA New England B-WET Proposal "Student-Centered Community Science: Monitoring Biodiversity in New England Coastal Ecosystems"	(2) Identifying polluted waters and developing plans to restore them (G) Well-informed, multisector input to decision making which includes underserved communities	Cornell University, CZM, New England NERRs	(Q2-Q4) Dates and locations of teacher training workshops and peer mentoring, number of participants and evaluation responses, (Q4) online access to water quality, invasive species, and biodiversity data from MassBays' planning area

Strategy 2.1 Support research to inform policy and actions

Task Title (Region) , Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Quantifying Phytoplankton and Turbidity in Salem Harbor (Lower North Shore) $2000 + 40h	***Ongoing*** Collaborate under a Healthy Estuaries grant to Salem State University to determine phytoplankton community structure and provide a better understanding of forcings causing high biomass that has been documented to be responsible for increased turbidity and share results and specific remediation strategies for water quality improvement in Salem Sound	(2) Identifying polluted waters and developing plans to restore them (C) Improved water quality	SSU	(Q1-2) Summary of remediation alternatives and strategies, (Q3) Attendee list and outcomes of a meeting for local, state, and federal stakeholders to convey results and recommendations, (Q4) Agenda and sign-in sheet for a public lecture
Implementation and Monitoring Dam Removals (South Shore) 250h	***Ongoing*** Work with municipalities and other partners to assess feasibility and seek funding for removal of dams and other barriers and collect ecological data pre- and post-restoration. Activities include post-removal monitoring at Peterson Pond Dam, assessing potential for a fish ladder at Jacob's Pond, working with Marshfield and Duxbury toward progress at Temple Street Dam and Veterans Memorial Park Dam on the South River, and working with Hanover and Pembroke to evaluate feasibility of Luddams Ford Dam removal.	(7) Protecting large aquatic ecosystems (B) improved habitat continuity and restored hydrology	Sea Run Brook Trout Coalition, Trout Unlimited, DFG, Hanover Mall, NOAA Fisheries, USFWS, DER, Towns of Norwell, Marshfield, Duxbury, Hanover, and Pembroke	(Q1) Application to Natural Resources Damages Grant Program for Luddams Ford Dam assessment, (Q4) annual progress report to funding agency for Peterson Pond/Jacob's Pond, (Q4) List of next steps for Duxbury and Marshfield based on initial data collection and partner input

Strategy 2.1 *continued*

Task Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Investigating Eelgrass Conditions in Duxbury-Kingston-Plymouth Bays (Central Staff, South Shore) $14,125 + 200h SS	***Ongoing*** Coordinate the annual "Eelgrass Blitz" rapid assessment with citizen scientists to monitor eelgrass extent and condition, and inform efforts to determine the causes of local eelgrass loss.	(7) Protecting large aquatic ecosystems (E) Restored natural communities	DMF, Duxbury Bay Maritime School, Town of Plymouth, Volunteers	(Q1, Q3) List of attendees and outcomes of team meetings (CS), (Q1) Intern hired (SS), (Q2) Number of volunteers trained, copy of training materials, photo documentation (SS), (Q2) Technical report describing findings and recommendations (all partners), (Q4) plan for 2022 assessment (all partners)
Increasing agency confidence in eelgrass maps used for project review and ocean planning (Central Staff South Shore, Metro Boston, Lower North Shore) $61,483 + 120h (RSPs) + 500h (CS)	***New (pending funding announcement)*** Design and implement a project to correlate eelgrass edge-of-bed determinations generated by remote sensing methods (drone, satellite, side-scan sonar, and fixed-wing aerial mapping) with divers' assessments. The objective is to support more accurate mapping of the resource to inform policies and protective actions. FFY21 activities include project planning and preparation; field activities and data analysis will take place concurrent with FFY22 funding (Summer 2022).	(7) Protecting large aquatic ecosystems (E) Restored natural communities	NOAA, CZM, DMF, DEP, MIT Sea Grant	(Q1) Agenda and outcomes of a meeting to launch the project, list of Steering Committee members, (Q2) QAPP, (Q4) Calendar of field activities, schedule for image acquisition, equipment inventory

Strategy 2.1 *continued*				
Task Title (Region) , Budget + LOE	**Description**	**CWA core program CCMP outcome**	**Partners**	**Timeline & Deliverables**
Marsh Edge Erosion Monitoring (Upper North Shore) $40,000 + 56h	***Ongoing*** Determine the erosional/deposition status of marsh bank and marsh edge in the creeks and rivers of Plum Island Sound to determine future living shoreline potential.	(5) Protecting wetlands (D) Resilient coastal habitat, including nature-based coastal protection	BU	(Q2) Map of Plum Island marsh banks depicting erosion/deposition status.
Inform adaptive management and sustainability of oyster aquaculture practice via partnerships with local and regional practitioners (Metro Boston) $3500 + 80h	***New (pending funding)*** Conduct research in partnership with local and regional stakeholders on how different oyster aquaculture grow-out methods may mediate the effects of water micropollutants and oyster parasites (Woods Hole Sea Grant Proposal "Determining how aquaculture grow-out methods can reduce the negative effects of parasites and micropollutants on farmed oysters")	(7) Protecting large aquatic ecosystems (D) Resilient coastal habitat, including nature-based coastal protection	TNC, oyster aquaculture practitioners	(Q3) List of partner organizations, (Q4) List of water quality and oyster parasite data to be collected beginning in Spring 2022

Strategy 2.2 Provide education, training, and technical support; share case studies (successful and not); and support collaboration and cooperation on specific topics

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
MassBays State of the Bays planning and outreach (Central Staff)	***New (postponed from FFY20)*** Plan and implement the State of the Bays water quality and habitat assessment, report, and outreach activities	All CWA core programs All CCMP outcomes	CZM, DER, DMF, DEP, MWRA, Mass Rivers Alliance, Management Committee, Towns, regional scientific and policy partners	1) State of the Bays Symposium or other public launch of the ecosystem condition tracking tool developed with funding from EPA EN Grant
Local priority program development and engagement, including regional conferences (Central Staff, All Regions) $75,000 + 200h UNS $450 + 150h SS $2000 + 40h CC $3500 + 80h MB	***Ongoing*** Partnership building and project development, funding efforts, and collaboration with environmental and other partner organizations and entities toward meeting the CCMP goals	All CWA core programs All CCMP outcomes	Municipalities, nonprofits, businesses, and government agencies	(Q1-4) Quarterly updates regarding local initiatives and progress, (Q1-4) Quarterly updates as relevant regarding regional conferences (e.g., Cape Cod Conference, Great Marsh Symposium), including copies of presentations, (Q4) List of networks and MassBays role
Greenscapes, Merrimack Valley Stormwater Collaborative (North Shore) $71,500 + 120h LNS	***Ongoing*** Create and disseminate outreach information, activities, and materials on stormwater management to *Greenscapes* member communities and Stormwater Collaborative members, in support of DPW directors and stormwater coordinators.	(2) Identifying polluted waters and developing plans to restore them (C) Improved water quality	IRWA, MVPC, MRWC, 25+ municipalities in Essex County	(Q1) List of Greenscapes communities, (Q2-3) MS4 Outreach and Education (via webinars, lectures, personal assistance), (Q1-2) updated outreach materials: website, workshops, handouts, presentations, (Q1-Q4) Stormwater Collaborative meeting agendas and attendee lists, (Q1-4) "Keeping Water Clean (KWC)" school program, regional workshops on water quality and quantity issues

Strategy 2.2 *continued*

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Support municipal and regional actions that promote resilient coastal habitats and communities through the use of nature-based solutions (Lower North Shore, Cape Cod) $40,000 + 400h LNS $808 + 20h CC	***Ongoing*** Work with partners and communities to encourage planning for climate change and adoption of adaptation measures that promote resilient coastal habitats, and use of nature-based solutions. Activities include assistance to secure funding via MVP and Coastal Resilience grant programs, and plan and implement those projects.	(5) Protecting wetlands (6) Protecting coastal waters through the National Estuary Program (D) Resilient coastal habitat, including nature-based coastal protection	Lower North Shore and Cape Cod municipalities	(Q4) List of communities assisted, (Q3) MassBays newsletter article describing one case study and lessons learned (Q3-4) At least one letter of support for municipal proposal, (Q4) List of relevant presentations and publications
Supporting municipal and regional actions for resilient coastal habitats and communities (South Shore) $3200 + 100h	***Ongoing*** Coordinate South Shore Climate Group for joint outreach and education efforts, assist communities in planning MVP projects, and assist Duxbury Beach Reservation and UMB with beach profiling	(6) Protecting coastal waters through the National Estuary Program (D) Resilient coastal habitat, including nature-based coastal protection	South Shore towns, CZM, MAPC, Duxbury Beach Reservation, UMB	(Q1-Q4) Monthly beach profile data, (Q4) Documentation of MVP community support provided, (Q4) SS Climate Group meeting agendas
Maintaining the Mystic River Urban Waters Federal Partnership (MyRWA) $13,500 + 320h	***New*** Coordinate the quarterly meetings of the EPA-convened Mystic River Watershed Steering Committee, and participate in EPA's Urban Waters Program.	(2) Identifying polluted waters and developing plans to restore them (C) Improved water quality	EPA, DEP, USGS, HUD, FEMA, Mystic River watershed municipalities	(Q1-4) Agendas, minutes, attendee lists for quarterly meetings, (Q1) detailed workplan developed with EPA Region 1 staff to be updated quarterly
Planning and Coordinating Federal input to the Mystic River Initiative	***New*** Review work proposed in the Partnership's Action Agenda, as well as identifying partnership and collaborative opportunities,	(2) Identifying polluted waters and developing plans to restore them	EPA, FEMA, USGS, HUD, Dept of Homeland	(Q2) Compilation of case studies from national Urban Waters programs, (Q1-4) agendas, minutes, attendee lists for Initiative meetings

$13,500 + 320h	and building and maintaining strong relationships with federal partners.	(C) Improved water quality	Security, others TBD	
Supporting local actions (MyRWA) $22,500 + 520	***New*** Implement Trash Free Mystic project, engage volunteers in river stewardship projects, support increased public access to the river, esp. via open space projects, conduct water quality monitoring and share results	(2) Identifying polluted waters and developing plans to restore them (C) Improved water quality	EPA, USGS, DEP, Mystic River municipalities	(Q4) summary of 2021-2022 activities, current status, and planning for 2022-2023, (Q4) report on volunteer engagement and activities conducted, (Q4) report on progress toward expanded public access under the Mystic Open Space and Mystic Greenways programs, (Q2) Report card announcements and data
Providing communications and outreach support to Mystic and Merrimack River watershed communities $18,000 + 416h	***New*** Assist EPA with Mystic River Watershed Initiative website, assist with biennial Mystic River Watershed Initiative Science Forum, conduct outreach and education re: Mystic River systems, significance, and threats, maintain a Merrimack River watershed mailing list and produce quarterly email updates	(2) Identifying polluted waters and developing plans to restore them (C) Improved water quality	EPA, FEMA, HUD, USGS, DEP, MRWC, municipalities	(Q4) updated website (www.epa.gov/mysticriver), (Q4) webpage including Forum agenda and presentations, (Q1-4) quarterly emails and progress summaries for Mystic Steering Committee, (Q4) list of education and outreach events, meetings, and materials shared with Mystic River watershed communities, (Q1-4) quarterly emails to the Merrimack River mailing list with (Q4) compiled/updated list

Strategy 2.2 ***continued***

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Great Marsh Outreach & Education (Upper North Shore) $10,000 + 35h	***Ongoing*** Support outreach and education of local publics through field trips in Fall 2021 and Spring 2022	(6) Protecting coastal waters through the National Estuary Program (G) Well-informed, multisector input to decision making which includes underserved communities	IRWA, ECGA, Parker River NWR, CZM, ENHC, MAPC, MassAudubon, Trustees	(Q1) Agenda and list of presenters, (Q3) List of field trips and number of participants
Support municipal and regional actions that promote resilient coastal habitats and communities through the use of nature-based solutions (Metro Boston) $5250 + 120h	***Ongoing*** Connect NU researchers and other experts to communities interested in green coastal infrastructure and living shorelines. Support and collaborate on regional projects. ***New*** Organize and facilitate NSF Convergence Accelerator workshops that bring together experts and leaders from academia, government, industry, and nonprofits with the goal of leveraging nature-based solutions as a framework to explore and shape co-development of convergent research that is stakeholder-driven, inclusive, and focused on implementation of sustainability solutions that promote clean, safe, smart, and equitable coastal communities	(5) Protecting wetlands (6) Protecting coastal waters through the National Estuary Program (D) Resilient coastal habitat, including nature-based coastal protection	BHEN, Metro Boston municipalities	(Q1-4) Dates and locations, number of participants for three waterfront site visits (virtual as necessary), (Q3-4) Documentation of at least two letters of support for municipal implementation proposals, (Q3) Number of participants and outcomes of Convergence Accelerator Workshops

Strategy 2.2 *continued*

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Advancing stormwater remediation (South Shore) $900 + 25h	***Ongoing*** Provide outreach and technical support re: stormwater management, including LID	(4) Addressing diffuse, nonpoint sources of pollution (C) Improved water quality	MassDEP, South Shore Towns	(Q1-4) Documentation of MS4 outreach in communities, (Q1-4) List of grant proposal support provided
Adopt a Beach and Talking Trash for Clean Oceans (Lower North Shore) $50,000 + 40h	***Ongoing*** Work with the public and schools to build marine debris awareness and institute behavior changes. Projects include conducting *Adopt a Beach* trainings, supporting volunteer "Beachkeepers," hosting community service projects, and educating the public of the seriousness of plastic litter on land and in the oceans	(6) Protecting coastal waters through the National Estuary Program (E) Restored natural communities	NOAA, Volunteer Beachkeepers, Talking Trash Teens	(Q1-4) List of volunteer trainings and numbers of volunteers, (Q3) List of community service projects, (Q3) report on litter reduction projects implemented in cooperation with restaurants, (Q4) List of relevant publications and presentations
Boston Harbor & Islands All Scientists Meeting/Science Symposium (Metro Boston) $7000 + 160h	***New (postponed from 2020)*** Facilitate the communication of research and monitoring in coastal ecosystems in Metro Boston to a diverse audience by co-organizing a fall event (and potentially a spring event) with SLL steering committee, potentially a multi-day event including field trips and site visits to Boston Harbor Islands (covid-permitting)	(6) Protecting coastal waters through the National Estuary Program (F) Robust interagency and interdisciplinary collaboration and partnerships (G) Well-informed, multisector input to decision making which includes underserved communities	BHEN, SLL, UMB, NPS, (additional partners to be determined)	(Q1) List of planning team members, (Q2) Draft agenda, (Q3) Final agenda, attendee list, and summary of evaluation feedback

Strategy 2.3 Provide access to, and increase influence on decision making by underserved communities

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Public Outreach and Education about Climate Change and its Impacts, and Adaptive Measures (Lower North Shore) $10,000 + 312h	***Ongoing*** Increase general climate change literacy and knowledge about coastal resiliency in the region, involving EJ populations wherever possible. Activities will include Community lectures and events, teacher institute on climate change.	(6) Protecting coastal waters through the National Estuary Program (G) Well-informed, multisector input to decision making which includes underserved communities	Lower North Shore towns and cities, SSCW volunteers	(Q1-4) Lecture series and events, photo-documentation of wave tank and other educational resources in use, (Q3) Case study of how teachers integrate LID and climate resilience activities with student stewardship
Merrimack River Water Quality Improvements (Upper North Shore) $10,000	***Ongoing*** Via a subgrant to MRWC, establish and implement regional goals to improve water quality on the Merrimack River. Oversee and provide administrative and technical support to the MRDC and its members in collaboration with MVPC, including support to interstate collaboration	(2) Identifying polluted waters and developing plans to restore them (G) Well informed, multisector input into decision making which includes underserved communities	Merrimack watershed communities and legislative delegation, NECC, WWTPs, Merrimack River recreational users, Planning Commissions (MA & NH)	(Q1, Q3) Agendas and lists of attendees to two meetings of the MRDC & Steering Committee, (Q2) Membership list for the interstate working group(s), including representatives of organizations that support and engage underserved communities, (Q4) Shared means for documenting status of MRDC priority actions established
Support regional engagement of underserved communities in ongoing resource management efforts (Central Staff, All Regions) 40h SS $1231 + 40h CC $2500 + 80h MB	***New and Ongoing*** Ensure that traditionally underserved communities (Commonwealth-designated EJ communities, groups underrepresented in marine science, and tribal communities) have access to and means to contribute substantively to decision making in the Bays	(6) Protecting coastal waters through the National Estuary Program (G) Well-informed, multisector input to decision making which includes underserved communities	EPA, EEA, Wompanoag tribal organizations, EJ-focused ngos, MMC, UMB SSL, UMB Institute for New England Native American Studies, others as identified	(Q2) Training, assessment, or other suitable event for RCs and MC members, (Q2) list of potential partnering organizations categorized by MassBays region and topic areas of interest, (Q4) List of communities/EJ-focused ngos engaged around which CCMP focus areas, (Q1-4) Updates on accommodations made, sample notices to target audiences

Strategy 2.3, continued

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Watershed and Coastal Science Education (South Shore) 75h	***Ongoing*** Engage diverse learners in watershed and coastal science education, bring new audiences to MassBays' mission, participate in classroom and field professional development for teachers	(6) Protecting coastal waters through the National Estuary Program (G) Well-informed, multisector input to decision making which includes underserved communities	Marshfield Community Television, Norwell Community Television, CCSCR, MassAudubon	(Q1-4) documentation of accommodation and outreach to support new participation by underserved communities, (Q4) List of events/presentations, videos and podcasts, and publications produced about coastal topics
Promoting meaningful engagement in decisionmaking among EJ communities (MyRWA) $18,000 + 416h	***Ongoing*** Identify priority issues among EJ communities in the Mystic River watershed, engage federal partners and coordinate collaborative projects to respond to those priorities, assist MassBays RCs in identifying and undertaking outreach and inclusion efforts	(2) Identifying polluted waters and developing plans to restore them (G) Well-informed, multisector input to decision making which includes underserved communities	EPA, GreenRoots, Harborkeepers, MRWC, others TBD	(Q1-4) record of meetings with EJ organizations and priority issues identified, as well as projects taken up, (Q2) record of meetings with each RC, (Q3) list of potential partners for each region, and their audiences, (Q4) examples or list of outreach materials, training, and/or other support provided to the RCs

Strategy 2.3 *continued*

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Increase awareness in Metro Boston of MassBays' work and mission (Metro Boston) $15,000 + 320h	***Ongoing*** Engage diverse learners in watershed and coastal science literacy, bring new audiences to MassBays' mission. Share virtual / online learning tools, including Seagrass Explorer – a virtual seagrass aquarium game, with diverse audiences including students in underserved communities; increase awareness of paid marine science opportunities in Boston and New England in an effort to make the field more equitable, inclusive, and diverse by co-moderating the New England Marine Science Opportunities listserv	All CWA core programs (G) Well-informed, multisector input to decision making which includes underserved communities	NUMSC Outreach Program, BHEN, MME, MMC	(Q4) List of accommodations implemented to support new participation by underserved communities, (Q4) Number of posts and members of the NE Marine Opportunities listserv, (Q4) Demographics of participants and summary of their evaluations of the High School Science Symposia and BEACHES program (Bridging Each Applicant's Chance for Higher Education Success), (Q1-4) Announcements of at least six science cafés, and lists of new MassBays newsletter subscribers, (Q4) List of panelists, number of attendees and summary of feedback related to a BHEN Career Panel for undergraduate and graduate students, (Q3) evaluation feedback from students on Seagrass Explorer

Strategy 3.1 Establish target (improved) water quality and habitat conditions for each embayment tied to desired uses and ecosystem services

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Update and expand utility of EDA (Central Staff, Metro Boston) $8750 + 200h MB	***New*** Disseminate results of EDA 2.1 and update the existing datasets, add new variables to support examining relationships among stressor, resource, and socio-economic factors, and identify priorities for environmental justice and restoration	(6) Protecting coastal waters through the National Estuary Program All CCMP outcomes	STAC	(Q2) Manuscript submitted to appropriate journal, (Q2) List of metrics and associated datasets representing socio-economic variables, (Q3) Shapefiles of each variable and characterization of each by EDA assessment area for Story Map update (Q4) List of priorities for environmental justice and restoration
Biological Condition Gradient/Ecosystem Services Gradient Targets set for Estuaries in MassBays (Central Staff, All Regions)	***New and Ongoing*** Final BCG and ESG-based targets for specific resources and launch efforts to measure progress towards those targets. Evaluate targets with resource-stressor data (EDA 2.1) to inform restoration priorities and strategies.	(6) Protecting coastal waters through the National Estuary Program All CCMP outcomes	STAC, EPA	(Q1) CCMP with targets incorporated submitted to EPA, (Q2) (tentative) paper for submittal to appropriate journal, (Q2-3) RCs assess potential priority actions based on targets and resource-stressor data, as well as local priorities regarding ecosystem benefits, to prepare for outreach efforts, (Q4) State of the Bays Symposium introduces the targets in terms of ecosystem benefits, as presented in the Ecohealth Tracking Tool (see next text)

Strategy 3.1, continued

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
MassBays Ecosystem Tracking and Reporting (Central Staff – All Regions)	***New (postponed from FFY20)*** Develop and implement a system to report on ecosystem conditions and trends in MassBays using indicators.	(6) Protecting coastal waters through the National Estuary Program All CCMP outcomes	UMCES	(Q3) Tracking system with indicators; (Q4) present tracking system at State of the Bays symposium.
Stakeholder Deliberative Process (Central Staff – All Regions)	***Ongoing*** Apply an innovative approach to ascertain local priorities and level of stakeholder commitment to working toward specific, improved environmental conditions in embayments in the MassBays planning area.	(6) Protecting coastal waters through the National Estuary Program All CCMP outcomes	UMass Boston	(Q1) Quantitative and qualitative results from workshops held in December 2020

Strategy 3.2 Guide local action to expand habitat and improve water quality according to targets

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Greening Gateway Cities Program (Lower North Shore) $15,000 + 312h	***New*** Increase tree canopy in Salem by recruiting volunteer caretakers, providing information about tree care while planting 2400 trees in Salem's designated planting zone, which includes EJ neighborhoods.	(7) Protecting Large Aquatic Ecosystems (E) Restored natural communities	City of Salem, Salem residents, DCR, Volunteers	(Q1-4) Number of trees planted on public and private property, (Q1-4) List of education & outreach actions, including via social media
Runnel applications in Essex Bay salt marshes (Upper North Shore) $20,000 + 35h	***New*** Assess tideshed hydrology and proximity to creek system, identify runnel application sites, pursue permits for work, and implement runnels in the Castleneck Creek marshes of Essex Bay	(5) Protecting wetlands (B) improved habitat continuity and restored hydrology (E) Restored natural communities	Town of Essex, UNH, MyRWA, Trustees	(Q1) Map of potential runnel installations, (Q2) Permits for work in wetland resource areas, (Q4) Map of implementation sites
Pepperweed Management and Control (North Shore) $2000 + 52h LNS $135,000 +75h UNS	***Ongoing*** Physical pulling of pepperweed to restore native high marsh community and coastal resilience.	(5) Protecting wetlands (E) Restored natural communities	Volunteers, Parker River NWR, MassAudubon	(Q1, Q3) List and map of prioritized sites, (Q3) Number of trained volunteers & volumes pulled, (Q3, Q4) Map of pepperweed sites with list of areas monitored and/or treated, with status (presence-absence removal)
Eelgrass seed restoration pilot project (Metro Boston) $5250 + 120h	***New*** Conduct eelgrass seed restoration pilot project at site(s) in and around Boston Harbor, engaging the BHEN community and community scientists in multiple stages of the restoration process; submit a letter of intent to fund a project building off this pilot study to RAE's NEP CWG Program	(7) Protecting Large Aquatic Ecosystems (E) Restored natural communities	EPA, BU, NEAq, BHEN	(Q1) Number of trained volunteers conducting flowering shoot collection, (Q2) Number of trained volunteers planting seeds, and acres planted, (Q2) LOI submitted to RAE under the NEP Coastal Watersheds Grant Program to fund an expanded effort in 2022; full proposal as invited

Strategy 3.2 *continued*

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Eelgrass Restoration (Upper North Shore) $45,000 + 90h	***Ongoing*** Restore eelgrass at Nelson Island site in Plum Island Sound; expand Plum Island Sound pilot eelgrass site to Middle Ground; investigate and establish pilot eelgrass sites where warranted in Northern Plum Island Sound, Salisbury waterways, Essex Bay and Annisquam River; engage volunteers and citizen stewards in the Great Marsh eelgrass restoration effort.	(7) Protecting Large Aquatic Ecosystems (E) Restored natural communities	BU, Parker River NWR, Mass Audubon, Volunteers	(Q1-4) Photos and interim reports documenting planting (restoring) Nelson Island site in Plum Island Sound using potato frames, and associated source-material harvesting at sites that match water site conditions, (Q1-4) Photos and interim reports documenting planting at the Middle ground pilot site (selected based on FFY20 investigations), (Q2) Report on investigations of potential new pilot sites; (Q1, Q2, Q4) Monitor and report on eelgrass success in Plum Island Sound and Essex Bay (previously established)

Strategy 3.2 *continued*

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Promote low-impact development (Lower North Shore) $20,000 + 312h	***Ongoing*** Promote and implement LID and stormwater green infrastructure in MassBays communities; maintain Commercial Street and Winter Island rain gardens in Salem; share lessons learned	(4) Addressing diffuse, nonpoint sources of pollution (C) Improved water quality	Greenscapes North Shore Coalition; LNS municipalities	(Q4) List of presentations and publications, and technical assistance and grant support provided, (Q4) documentation of one newly implemented LID approach, (Q1-4) Photodocumentation of flood/storm conditions at rain gardens
Identify and implement stormwater mitigation and low-impact development projects (Cape Cod) $15,346 + 380h	***Ongoing*** Identify and implement priority projects with partners, as part of APCC's Restoration Coordination Center (RCC) activities	(2) Identifying polluted waters and developing plans to restore them (4) Addressing diffuse, nonpoint sources of pollution (C) Improved water quality (E) Restored natural communities	Cape Cod towns, CCCD, NRCS, DER, CZM, DMF, CCC, CCE, WHOI Sea Grant	(Q1-4) Quarterly list of communities assisted and type of assistance provided to each (grantwriting assistance, monitoring, training, other), (Q4) list of presentations and publications, (Q4) reports resulting from any project implementation
Solutions to protect eelgrass from docks and recreational boating (Lower North Shore, Central Staff) $10,000 + 200h	***Ongoing*** Enhance estuarine seagrass habitat by informing management efforts to reduce stressors impacting seagrass habitat, i.e., habitat fragmentation posed by shading from docks and floats. Activities include finalizing study-area docks and securing participation by owners, plan and implement acoustic mapping, and conduct data analysis and education and outreach.	(7) Protecting large aquatic ecosystems (E) Restored natural communities	Salem & Marblehead harbormasters, Conservation Commissions, private dock owners, DMF, EPA, ACOE, UNH, SSCW volunteer	(Q1) Qualitative survey of eelgrass bed conditions adjacent to dock structures, (Q3) Final report, (Q4) List of presentations and number of attendees

Strategy 3.2 *continued*

Title (Region), Budget + LOE	Description	CWA core program CCMP outcome	Partners	Timeline & Deliverables
Seagrass and Oyster Restoration Story Map (Metro Boston) $5250 + 120h	***Ongoing*** Disseminate the results of a project surveying seagrass restoration and management projects in MA to inform future efforts using an online ArcGIS Story Map. ***New*** Expand the Story Map to include oyster restoration and management projects in Massachusetts.	(7) Protecting large aquatic systems (E) Restored natural communities	SeagrassNet, BHEN, others TBD	(Q2) Summary table of survey and interview responses from oyster restoration practitioners, (Q3) Summary of comments on draft revised Story Map provided by partner networks, (Q4) List of improvements made based on user feedback, (Q4) Manuscript submitted to appropriate journal
State of the Waters: Cape Cod (Cape Cod) $20,192 + 500h	***Ongoing*** work with partners to maintain and update a comprehensive "State of the Waters: Cape Cod" program to report on the condition of the Cape's coastal and fresh waters and their problems, causes, and possible solutions. Water quality grades will be reported via an annual report, rollout at APCC's annual meeting, website and other outreach materials. The goal is to promote action to protect and restore water quality. The project is intended to serve as a model for other communities.	(6) Protecting coastal waters through the National Estuary Program (C) Improved water quality (F) Robust interagency and interdisciplinary collaboration and partnerships	CCS, Buzzards Bay Coalition, CCC, SMAST-UMass Dartmouth, WBNERR, MBL Ecosystems Center, CZM, MET, Cape Cod towns	(Q1) Compile 2020 WQ data for coastal waters, fresh water bodies, groundwater, drinking water, and other water resources, including in underserved communities, (Q2) Final report for 2021 (grades up to and including 2020 as available), (Q1-4) Dates and attendees lists from Advisory Committee meetings, (Q4) Draft list of 2021 data sources in preparation for 2022 update, (Q4) Updated outreach materials, including website; list of presentations and publications
Maintaining Adequate Streamflow in First Herring Brook (South Shore) $11,938 + 100h	***Ongoing*** Support the Town of Scituate in the effort to raise their reservoir and provide adequate downstream flow, and promoting public service announcements (PSAs) regarding water conservation.	(7) Protecting large aquatic systems (B) Improved habitat continuity and restored hydrology	Town of Scituate, DER	(Q1) List of platforms taking up the PSAs, (Q2) Report on use of seasonal streamflow management tool, (Q1-4) Documentation of support provided to the town around permitting and outreach

D. Budget

Narrative
These notes refer to **Table 2, *MassBays National Estuary Program Proposed Budget, FFY2021*.**

Assumptions – Section 320 funding allocation to MassBays will be $700,000.

Proposed Spending

Salaries for two staff: Executive Director (1.0FTE), and Staff Scientist (0.6FTE). The Circuit Rider's salary, fringe, and indirect costs are covered by the EPA Exchange Network Grant.

Fringe benefits: Fringe benefits rate is 39.5% of salaries.

Contractual

- AquaQAPP Operations & Maintenance. Eastern Research Group will provide on-call tech support, and maintain code and hosting for AquaQAPP through December 2021 under the current proposed budget.
- Heroku app hosting. MassBays is supporting access to iSeaGrass, an app that allows users to provide real-time, field-based reporting about eelgrass presence/absence, condition, and other parameters. Cost is $15.99/month.
- Verizon cellular service. The coastal acidification monitoring system will transmit real-time data with this subscription at a cost of $37.99/month.

Other Expenses

- Regional Service Providers. This year we request a total of $318,000 to come from the §320 base grant monies for RSP support.

- Mystic River Watershed Initiative. We request $90,000 to support the Mystic River Watershed Association's work under EPA's Urban Waters Program. Tasks included in their scope of work are highlighted in yellow in Section C and labelled "(MyRWA)"

- Healthy Estuaries Grant Program. The proposed budget includes $45,000 for grant funding to support implementation of the CCMP. This exceeds the CCMP measure of 5% of our §320 allocation to be dedicated to this purpose, and will result in approximately 90,000 available for the 2022-2023 grant round. We anticipate an emphasis on projects in EJ communities for the next RFR.

- Meeting expenses. The budget includes a modest allocation of $548 for meeting expenses/light refreshments to support Management Committee meetings, regional workshops for the BCG target review, and a State of the Bays Symposium.

- Shared Agency Expenses. The budget includes $4800 charge-back to the Executive Office of Energy and Environmental Affairs, to cover costs of services including HR support, internet and phones, copier and computer leases, and office supplies.

Travel (see Table 3)

We propose new funding of $5256 for the following:

- NEP national meetings
    - Fall Technical Transfer Meeting, hosted by Tampa Bay Estuary Partnership (Central Staff/2 travelers)
    - Spring 2022 Annual Meeting, Washington DC (Director/1 traveler)
- Other Professional Development Conferences

    - Assuming limited travel expenses and registration fees for professional development and regional conferences, New England-wide (Director and Staff Scientist)
- Regional meetings, workshops, and site visits
    - CCMP implementation oversight, regional education & outreach workshops, grantee site visits, etc., MassBays-wide (Director and Staff Scientist)
- NE Regional NEP meetings
    - Visits for collaboration and joint programming discussions, New England-wide (Director and Staff Scientist)

Indirect Charges
The indirect cost rate is 14.04%. This rate was negotiated in accordance with the OMB "Super-Circular" and with regulations promulgated by the Commonwealth Secretary of Administration and Finance. A copy of the current indirect rate cost agreement is attached to this application. The indirect rate is charged to expenditures relating to personnel and contracts. It is charged at the same rate for federal and non-federal personnel and contracts.

Matching Funds
Subgrantees. Regional partners, in their scopes of work to serve as RSPs to MassBays, identify sources of match for the program. Direct match of at least 50% is required; this year a total of $268,106 is offered by the RSPs (Table 7). An additional 25% match ($11,250) will be realized on the Healthy Estuaries Grant line item.

Program Match. Several of the RSPs have also identified a substantial cash and in-kind match, detailed in Table 7. These funding sources are linked directly to the implementation of the CCMP, a total of $268,375 (detailed in Table 8). Sources of match offered include revenue from membership, state and local grants, private foundations, etc., as well as the work of staff within these organizations on projects specifically related to our estuarine restoration and conservation efforts. MyRWA will document $90,000 in program match.

In addition, $7234 in-kind services are anticipated from Management Committee and Subcommittee members not already accounted for in the RSP match; MassBays will receive $150,000 state funds this fiscal year from DEP for implementation of the Massachusetts Coastal Condition Assessment. These items total $157,234.